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Initial Social Complexity in Southwestern Asia

The Mesopotamian Advantage[1]

by Guillermo Algaze

The emergence of early Mesopotamian (Sumerian) civilization must be understood within the framework of the unique ecology and geography of the alluvial lowlands of the Tigris and Euphrates Rivers during the late 5th and 4th millennia B.C. The former gave Mesopotamian societies important advantages in agricultural productivity and subsistence resource resilience not possessed by contemporary polities on their periphery, while the latter gave them enduring transportational advantages. This material imbalance created opportunities and incentives that made it both possible and probable that early Mesopotamian elites would use trade as one of their earliest and most important tools to legitimize and expand their unequal access to resources and power. Given this, a still hypothetical (but testable) model is presented that accounts for the precocious socioeconomic differentiation and urban growth of southern Mesopotamia in the 4th millennium as social multiplier effects inadvertently set in motion by evolving trade patterns. This trade was first largely internal, between individual southern polities exploiting rich but localized ecological niches within the Mesopotamian alluvium during the Late Ubaid and Early Uruk periods. By the Middle and Late Uruk periods, however, inherently asymmetrical external trade between growing southern cities and societies at their periphery in control of coveted resources gained more prominence. In due course, import-substitution processes further amplified the one-sided socio-evolutionary impact on southern societies of these shifting trade patterns. Unequal developmental rates resulting from the operation of these processes over time explain why the earliest complex societies of southwestern Asia appeared in southern Mesopotamia and not elsewhere.

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In a recent review of Gary Feinman and Joyce Marcus's edited book *Archaic States* (1998), Robert McCormick Adams (2000) expresses surprise that contributors generally neglected issues pertaining to the social evolutionary impact of interrelationships between human societies and their natural ecosystems. "It is a sign of our times," he argues, "that questions like these, so seriously regarded a generation ago, are presently as widely disregarded as they appear to be in this otherwise state-of-the-art collection." The absence of such questions partly obscures our understanding of the very processes that the various contributors to *Archaic States* seek to clarify. Social process viewed in a vacuum is tantamount to social determinism, which ultimately is as incorrect as the geographical determinism that often tainted the work of an earlier generation of anthropologists and geographers (Livingstone 1992). Socioeconomic systems invariably operate within geographical and ecological constraints on the social actions that are possible (given existing technologies) and probable (given earlier developmental trends [path dependency] and cultural perceptions of opportunities and threats) at any one time. For this reason, history displays a wide range of results of the interaction of societies and their environment. At the same time, however, evolving environmental factors can also extend the boundaries of both the possible and the probable by acting, in the words of Joel Mokyr (1990), as "focusing devices" that powerfully influence the direction that societies take in their search for technological innovations. New technologies, in turn, to quote Robert Heilbroner (1994[1967]:59), "cannot but impose certain social and political characteristics upon the societies in which they are found."

To be sure, neither Mokyr nor Heilbroner advocates a return to Marxian technological reductionism. Both well understand that the present is shaped from the past by a combination of selective pressures that impose a measure of directionality on human history, random accidents, and unpredictable innovations that add an element of indeterminacy to any attempt at historical explanation. Moreover, both are well aware that technological innovation not only acts on society but is itself often contingent on socioeconomic forces (Scranton 1994). However, their admonitions as to the social consequences of technological innovation and the existence of an often close relationship between ecological context and technological change do raise important issues for archaeologists attempting to explain the evolution of

1. Earlier drafts of this article were read and criticized by Elise Auerbach (University of Chicago), Claudio Cioffi-Revilla (University of Colorado), Alex Joffe (Penn State University), Joyce Marcus (University of Michigan), Robert McC. Adams (UCSD), Jennifer Pournelle (UCSD), Steve Rosen (Ben Gurion University), Michael Rosenberg (University of Delaware), Eric Rupley (University of Michigan), Gil Stein (Northwestern University), Donald Tuzin (UCSD), Tony Wilkinson (University of Chicago), and several anonymous CA referees. Each offered substantive criticism, important editorial comments, and crucial missing references. Their invaluable contributions are acknowledged with gratitude, even though occasionally I chose to disregard their advice. Remaining errors of omission and interpretation are entirely my own. The manuscript also owes much to the editorial comments and grammatical corrections of my wife, Susan Becker Algaze. The accompanying map (fig. 1) was ably drafted by Valerie Batt.

complex societies. In addition to taking into account the dynamics of social and economic interactions within and between societies, such attempts must also explore what technological innovations the groups under investigation developed in order to adapt to or, alternatively, to circumvent or transform their evolving environmental and geographic context.

This latter perspective is adopted here to explore the emergence of early Mesopotamian (Sumerian) civilization in the alluvial lowlands of the Tigris and Euphrates Rivers of southern Iraq during the so-called Uruk period, roughly dated to 3800–3100 B.C. This emergence entailed a veritable revolution in human social and spatial organization, culminating in new conceptualizations of the nature of the social order (Baines and Yoffee 1998) and the rise of the world's earliest cities and states (Adams 1966, 1981; Adams and Nissen 1972; Nissen 1988; Stone 1997). Of the myriad aspects of this phenomenon, this paper focuses on explaining why the earliest urbanized state societies in southwestern Asia emerged in the alluvial lowlands of the Tigris and Euphrates fluvial system and not elsewhere. This question is now relevant because recent work across portions of southwestern Iran, northern Iraq, northern Syria, and southeastern Turkey shows that in those areas societies comparable in their scale and level of organizational complexity to those of 4th-millennium southern Mesopotamia arose only after the Sumerian emergence and, to a great degree, as a reaction to it (Algaze 1993).

By the beginning of the 3d millennium, for instance, we witness the emergence of a Proto-Elamite state that extended over parts of Fars and Khuzestan provinces of southwestern Iran and exerted considerable influence over remote areas of the Iranian Plateau (Alden 1982, Lamberg-Karlovsky 1996). Equally pertinent and better documented are the numerous competing Early Bronze Age city-states, each centered at a fortified capital of substantial proportions, that coalesced across the well-watered plains of northern Syria, northern Iraq, and southeastern Turkey (hereafter Syro-Mesopotamia) sometime during the middle of the 3d millennium (Weiss 1983, 1986, 1990; Wilkinson 1994). Recent reviews of pertinent evidence by both Weiss (1983, 1986) and Wilkinson (1994, 1997) show that these urban societies had associated settlement networks that were as complex, differentiated, and extensive as those that had existed in southern Mesopotamia prior to the Sargonic period. They also show that for most of the Early Bronze Age the agricultural potential of the high plains of Syro-Mesopotamia (based on extensive rain-fed cultivation of grain) was sufficient to sustain the urban systems that developed there.

Best-known among the Early Bronze Age city-states of Syro-Mesopotamia is ancient Ebla (Tell Mardikh), near Aleppo, where the chance find of palace archives helps us better understand the internal social and economic structure of the city and the extent of the regional economic and political control that it was able to exercise (Arcari 1988, Archi 1990, Astour 1988, Bonechi 1993, Matthiae 1988). These archives also reveal the degree to which the organizational structure of Ebla (and presumably that of other comparable Syro-Mesopotamian cities) paralleled earlier and contemporary southern Mesopotamian prototypes. Economic texts, for instance, reveal patterns of palatial control of animal herds and of various strategic industrial activities (e.g., metals and textiles) that are immediately comparable to contemporary practices in southern Mesopotamian city-states (Archi 1988).

If the potential to support regionally organized and urbanized state-level societies existed in a variety of regions of southwestern Asia, how does one account for the temporal primacy of social complexity in southern Mesopotamia? I believe that this primacy was the result of social and "technological" innovations that were selected for and promoted by the unique geographic and environmental framework of the Tigris-Euphrates alluvial lowlands. This is a point already made by Adams (1978, 1981) but one that bears being revisited because new analytical methodologies allow for more precise interpretations of the available survey data from southern Mesopotamia than were heretofore possible. At the same time, new paleoenvironmental data and computer simulations of ancient climates allow for more precise reconstructions of the ecology of the alluvial lowlands of the Tigris and Euphrates Rivers at the time Mesopotamian civilization first crystallized than have been practicable until now.

More specifically, I argue that the primacy of southern Mesopotamia was in part due to the fact that southern societies had several important material advantages over polities in neighboring areas. These included (1) a denser and more varied concentration of exploitable subsistence resources, (2) higher and more reliable agricultural yields, and (3) an exponentially more efficient distribution system based on water transport. These advantages promoted the creation of inherently asymmetrical exchange patterns among independent polities in the Mesopotamian alluvium and between those polities and societies in neighboring regions which, over time, produced important organizational asymmetries between southern societies and contemporary polities. In particular, by the second half of the 4th millennium the various advantages listed had promoted the emergence and rapid diffusion of innovative mechanisms of commodity production, labor control, and information processing within the myriad competitive but mutually communicative polities occupying the southern Mesopotamian alluvium and immediately associated areas (Susiana). These innovations can be classed as "ideational" technologies, and more than anything else they help explain why the initial locus of early state development in southwestern Asia was the alluvial lowlands of the Tigris and Euphrates Rivers.

In the sections that follow, I discuss the various material and ideational advantages underpinning the rise of early Mesopotamian civilization in the Uruk period.

Is Geography Destiny?

While geography is certainly not destiny, southern Mesopotamian societies, at their outset, did enjoy a variety of environmental and geographical advantages over their neighbors that increased the likelihood that self-aggrandizing individuals and factions in the south would be more successful in maintaining, expanding, and legitimizing unequal access to resources and power than their peers in surrounding areas. This made it probable that complex societies would emerge earlier in southern Mesopotamia than in other regions of southwestern Asia.

The first advantage of the southern societies over polities in immediately adjoining areas was the greater resilience with regard to subsistence failure of the Tigris-Euphrates lowlands resulting from a greater variety and denser concentration of exploitable subsistence resources. As Adams (1978; 1981:11–14) has noted, southern Mesopotamian societies could easily exploit several complementary ecosystems at the same time, including (1) the irrigable alluvial plain, which provided high once-a-year yields of subsistence crops, principally barley, (2) smaller irrigable areas near the rivers, providing for intensively cultivated gardens and orchards where multiple high-value crops could be produced throughout the year, (3) fallow fields within and outside the irrigated areas that provided extensive pasture lands for millions of sheep and goats and some cattle, and (4) rivers, artificial canals, freshwater marshes, and brackish lagoons and estuaries that provided plentiful protein in the form of fish and fowl, as well as reeds and other useful products.[2] In contrast, save for a once-a-year crop of dry-farmed grain and ample pasture lands, the high plains and intermontane valleys on the periphery of the Mesopotamian lowlands offered no comparably varied, resilient, or dense concentrations of subsistence resources.

If anything, the natural advantages of the south over the north in resource variety and density would have been particularly pronounced through much of the Late Ubaid and Uruk periods. Central to this advantage was the array of littoral resources that would have been available to Mesopotamian societies at that time (Pournelle 2000). Recent geomorphological work shows that a mid-Holocene maritime transgression dating to the late 5th and 4th millenia raised the level of the Persian Gulf to some 2 m above its present elevation. This resulted in an intrusion northwards of the head of the Persian Gulf of up to 200 km in places (depending on local variations of elevation and differential subsidence rates), thus placing the resource-rich marshes and estuaries of the gulf's littoral zone in close proximity to Uruk population centers such as Eridu, Ur, Uruk, Girsu, and Umma (Sanlaville 1989) (fig. 1).[3] Not only were these resources particularly accessible but they were especially dense and varied at this time. Sedimentological evidence from deep-sea cores in the Persian Gulf indicates that summer monsoonal rains of Indian Ocean origin had a more northerly track during the late 5th and early 4th millennia than at present, bringing intense monsoonal rains to large parts of the Mesopotamian alluvial plain and the entire length of the Persian Gulf (Sirocko et al. 1993, Petit-Maire, Sanlaville, and Yan 1995). The consequences of this climatic phenomenon for littoral resources are well understood: the resulting upwelling of nutrient-rich waters and increased water oxygenation would have caused across-the-board biomass productivity increases (Reichart et al. 1997) both throughout the gulf and its estuaries and within the mosaic of canals, marshes, and lagoons surrounding many Uruk population centers.

The second advantage of southern Mesopotamia over its neighbors was provided by the higher yields and reliability of the southern agricultural base. While this edge was to taper off somewhat after the Uruk period, it never totally disappeared, and it naturally increased the aforementioned beneficial impact of greater resource variety and density. Modern agricultural data from a variety of locales in southeastern Turkey, northern Syria, northern Iraq, and southern Iraq show that, under conditions of controlled irrigation, the alluvial landscape of southern Mesopotamia is, on average, about twice as productive per unit of land than the rain-fed agricultural regimes characteristic of northern societies (Weiss 1986: figs. 1 and 2; Wilkinson 1990*a*:42–46). Although there are no exactly comparable ancient data regarding productivity per standardized land unit, inferences derived from cuneiform records of late-3d-millennium date bearing on seed-to-yield ratios suggest that irrigated lands in the south had an advantage in terms of productivity over nonirrigated lands elsewhere that was roughly in the 3:1 range.[4] Finally, provided that labor existed to maintain, repair, and deepen canals, drain excess water from fields, and build levees, the reliability of irrigated agriculture

2. Dried fish used as rations were essential to the economy of Mesopotamian city-states in the historical periods (Englund 1990), and they also figure prominently in some of the Archaic Texts dating to the very end of the Uruk period and the immediately following Jemdet Nasr phase (Englund 1998:128–43).

3. Some of these early centers, in fact, may owe their location precisely to their proximity to littoral resources at the time of their foundation. In reviewing factors that affect urban location, the economist Paul Bairoch (1988) argues that cities preferentially form at the end of transport routes or at the juncture of two different types of transport routes. The southernmost Uruk centers (Uruk, Eridu, Ur, Umma, and Girsu) were thus at the same time at the end of the vast north-south transport route created by the rivers and within reach of the lateral routes created by extensive marshes and lagoons at the encroaching head of the Persian Gulf in the 4th millennium. This privileged position naturally lessened their transportation costs and maximized their access to resources from various areas.

4. Cuneiform records dating to the Ur III period (last century of the 3d millennium), for instance, suggest that yield-to-seed ratios of 30:1 were normal for irrigated fields in southern Mesopotamia and that higher ratios (up to 50:1) were possible (Jacobsen 1982, but see the reservations of Powell 1985). While comparable data are not available from dry-farmed areas in Syro-Mesopotamia in antiquity, ratios for modern grain from a variety of Near Eastern locales cultivated under traditional dry-farmed agricultural practices suggest that yield-to-seed ratios in the 7:1 to 9:1 range appear normal for wheat and barley (Russell 1988:tables 3, 15, 18).

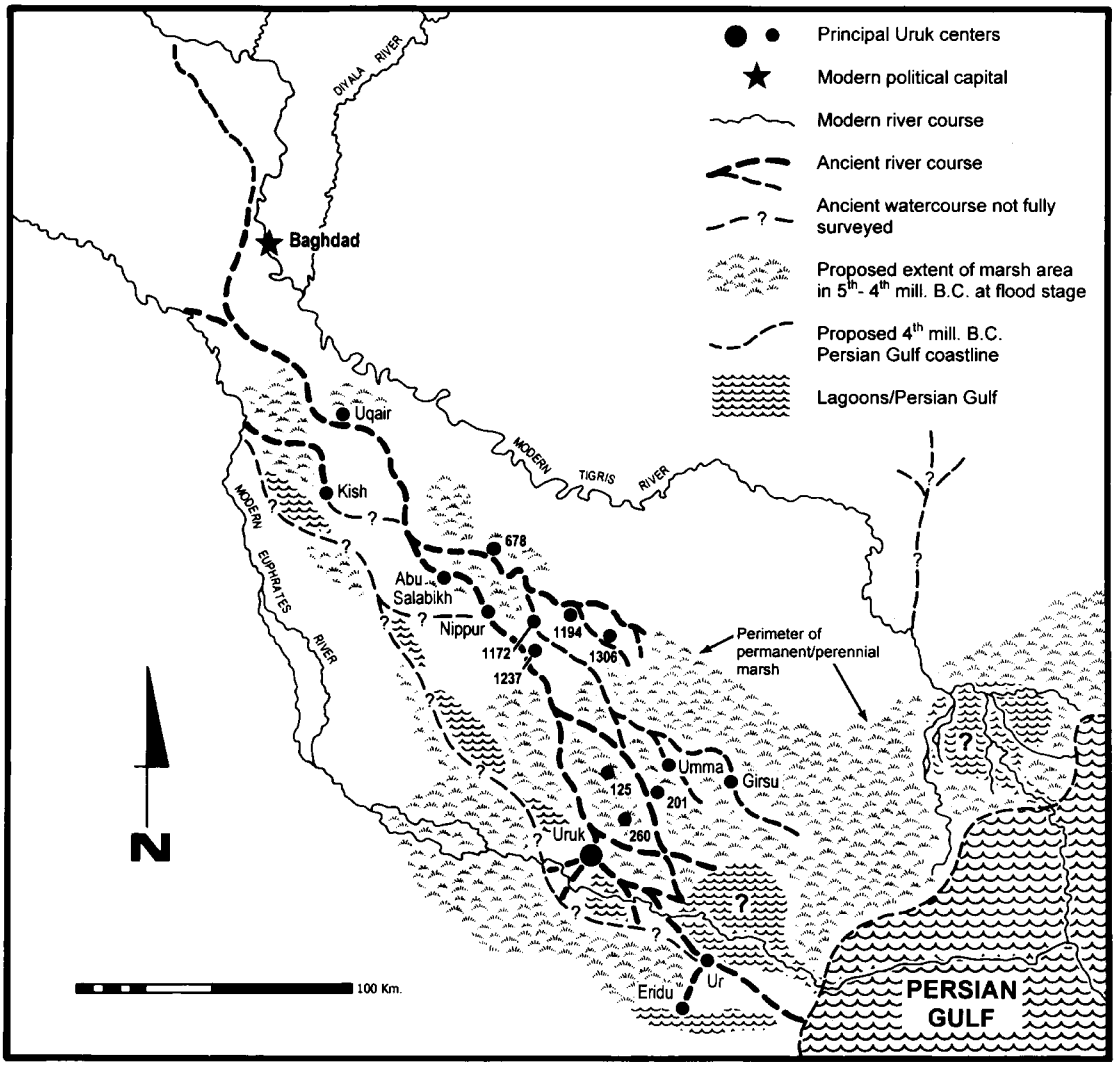

FIG. 1. *The ancient Mesopotamian alluvium during the late 5th and 4th millennia* B.C., *showing the location of principal Uruk centers and major watercourses at the time (more precise assessments are the subject of ongoing research by R. McC. Adams and J. R. Pournelle at the Mesopotamian Alluvium Project Laboratory, University of California, San Diego). Location of probable marsh boundaries and Persian Gulf coastline deduced following Sanlaville (1989). Map by and courtesy of J. R. Pournelle, following Adams (1981, 1999) and Pournelle (2000).*

in the south was greater than that typical of the dry-farmed areas of the north, which are subject to substantial and unpredictable spatial and temporal variations in rainfall (Perrin de Brichambaut and Wallén 1963:figs. 2 and 3; Cullen and deMenocal 2000; Turkes 1996).

The natural advantages in yield, reliability, and predictability of the southern Mesopotamian landscape would also have been particularly pronounced throughout much of the 4th millennium. A unique conjuncture of three related factors helps account for this. The first factor is climate. The results of new paleoenvironmental (Bar-Matthews, Ayalon, and Kaufman 1997, Blanchet, Sanlaville, and Traboulsi 1997, Frumkin et al. 1999) and geomorphological (Hole 1994, 1997; Wilkinson 1999) investigations from various Near Eastern locales can be combined with recent computer simulations of global (de Noblet et al. 1996, Harrison et al. 1998), latitudinal (Hoelzmann et al. 1998), and regional (Bryson and Bryson 1997, 1999) climatic changes resulting from orbitally induced variations in the amount of solar radiation reaching the earth at about 4000 B.C. to reconstruct mid-Holocene climatic conditions across the Near East. These data suggest that, when compared with that of the historical periods, the climate of the region at the 5th/4th-millennium transition was generally wetter, with warmer winters and cooler summers. Further, as much

as a tenfold expansion (from present levels) in available surface water appears to have been the norm at the time (Hoelzmann et al. 1998:46). This meant that marginal areas of the Mesopotamian alluvium that are today unproductive because of insufficient water or lack of drainage would likely have been integrated into fluvial networks draining into the sea (Hoelzmann et al. 1998:47). Additionally, the already noted Persian Gulf sediment cores indicate that parts of the southern Mesopotamian alluvium that today receive no summer precipitation whatsoever would have been affected by summer monsoonal rains. Such rains would have been absent from the Upper Mesopotamian plains at this time (Blanchet, Sanlaville, and Traboulsi 1997:fig. 2). The same cores (Sirocko et al. 1993, Nützel 1976) suggest that conditions of increasing aridity and extreme seasonality that more closely approach those prevailing at present started to appear by the second half of the 4th millennium and became fully established by the onset of the 3d millennium (Butzer 1995). This conclusion is supported by palynological data from lake cores in the Zagros-Taurus mountain ranges (van Zeist and Bottema 1991).

The implications of these climatic data go well beyond the issues already discussed in reference to littoral resources. The data have equally important implications for the productivity of the southern Mesopotamian alluvial plain through much of the Uruk period. Increased winter precipitation in the Tigris-Euphrates watershed as a whole would have increased river volume in the spring, making both canal and flood-recession irrigation easier throughout the southern lowlands. Increased precipitation would have fallen on the alluvium itself at this time, including some rain in the now barren summer months. Wetter winters with warmer average temperatures would have allowed winter grain crops to mature earlier than they do today, thus minimizing production losses due to heat. Cooler summers with cloud cover associated with the monsoonal regime of the time would have decreased soil moisture loss throughout the alluvium, thus increasing the likelihood that some high-value crops could have been grown successfully in the area well into the summer.

The second factor serving to heighten the natural advantages in yield and reliability of the Mesopotamian alluvium during parts of the 4th millennium was the behavior of the Tigris-Euphrates fluvial system at this time. New and ongoing research by Robert McC. Adams (1999) and Jennifer Pournelle (1999) confirms earlier suggestions by Adams (1981:16–17) and others (e.g., Gibson 1973) that the main channels of both the Tigris and the Euphrates have moved considerably over the course of the past 6,000 years or so. Using newly declassified satellite images (CORONA), Adams and Pournelle have been able to correlate the location of previously surveyed 4th-millennium sites in the south with relict river channels that are visible in the new images but were not identifiable with precision in previously available air photos or LANDSAT images of the area. From this they conclude that large portions of the main channels of the Tigris and the Euphrates were actually located within a short distance of each other (ca. 25–50 km) during the 4th millennium and that the two rivers actually joined at several locations within the Mesopotamian alluvial plain of the time, creating a single complexly intertwined fluvial system (fig. 1). The rivers separated to their present courses only *after* the Uruk period, presumably as a result of the combined effects of environmental forces and anthropogenic processes that started in the 4th millennium.[5]

Adams and Pournelle's conclusions are very relevant to the issue of yield differences between alluvial Mesopotamia and its neighbors during the Uruk period. It is very likely that throughout much of the 4th millennium the waters of the two nearby rivers commingled at flood stage in the northern parts of the alluvium, where their courses came closest. Increasing this possibility is the fact that the rivers carried a greater overall amount of water at that time. The result would have been the creation of larger areas than exist at present where various types of high-value vegetables, fruits, and even some cereals (e.g., sesame and millet) might have been produced in late spring and possibly even early summer by means of simple flood-recession irrigation (Sanlaville 1989:24; Pournelle 1999).

The third factor adding to the advantage in productivity of the southern alluvial lowlands over neighboring areas was the effect of the Persian Gulf transgression on the fluvial dynamics of the Tigris-Euphrates river system. One such effect was that, by reducing the overall length of the rivers, the intrusion would have aggravated the rivers' natural tendency to meander and overflow their banks (Hole 1994) at the same time that it raised the level of the water table in the surrounding alluvial plain (Sanlaville 1989:18). This would have increased the size of the areas subject to flooding without the need for substantial human intervention at times of overflow.

The importance of flood-recession irrigation for the initial crystallization of Mesopotamian civilization should not be underestimated. Using ethnographic and economic data from Senegal and elsewhere, Thomas Park (1992) has shown that recession irrigation is generally the most productive form of agriculture known in terms of units of labor invested, irrespective of the crops being exploited. He argues that this practice represents a powerful spur for the evolution of social stratification

5. One of the long-term effects of the Persian Gulf transgression noted earlier would have been to increase overbank sedimentation in the areas between the two rivers through the 4th millennium as a result of reduced river length, gradient, and velocity (Butzer 2001). This natural process contributing to the buildup of sediments separating the two rivers would have been compounded by the unintended consequences of man-made irrigation efforts. As noted by Pournelle (1999 and personal communication, 2000), by decreasing the volume of water in the main river channel, Uruk-period irrigation efforts would have reduced the river's ability to carry its silt load, thus contributing to a further increase in sediments deposited in the surrounding alluvium. Additionally, because irrigation efforts at the time naturally focused on the intervening areas between the Tigris and the Euphrates, those efforts must have heightened levee buildup along artificial channels in the intervening areas as well as increased the silt loads deposited in preferentially flooded fields within those areas.

in societies practicing it because of the particularly high variability of output that it creates between well-irrigated, poorly irrigated, and unirrigated lands. Thus, flood-recession irrigation is likely to have been important in the initial development of population agglomerations in the alluvium—particularly in its northern portion, where the rivers came closest to each other. Not coincidentally, this is precisely the portion of the alluvium in which Adams's (1981) surveys document the most precocious development of Uruk urban centers (Early Uruk period).

Although it never totally disappeared, the overall southern edge in yield and reliability per unit of land provided by irrigation would have diminished somewhat after the Uruk period for several reasons. First, as the gulf intrusion receded (lowering the water table across the alluvium) and as the main channels of the rivers separated because of natural and man-made levee buildup following the Uruk period (see n. 5), the extent of areas exploitable by flood-recession agriculture would have been reduced. This would have necessitated the construction of ever larger and more expensive canals in order to make up in grain production for the decline in higher-value crops. Second, after centuries of irrigation, the higher water-table levels of the 4th millennium would naturally have resulted in varying degrees of salinization of parts of the alluvial plain (Jacobsen and Adams 1958; Adams 1981:151–52). This largely unavoidable process would have been compounded by attempts to shorten fallow (Gibson 1974) and to bring ever more marginal lands under cultivation as competing Early Dynastic polities tried to gain advantage over their peers by further increasing agricultural production within their territories.

At the same time that overall yields were eroding in the south, developments outside of the Mesopotamian alluvium were helping increase agricultural yields across the periphery, thereby contributing to a lessening of yield differences between the two areas *after* the Uruk period. As noted by Wilkinson (1994), the higher average southern yields per unit of land were eventually partly circumvented in the Syro-Mesopotamian plains, at least in the short term, by the intensive application of manure on cultivated areas near settlements and by an increase in the overall amount of land under cultivation (on this point, see also Weiss 1986). However, these forms of intensification required the formation of small territorial states able to draw on agricultural resources from relatively broad areas through several tiers of dependent settlements, and there is no incontrovertible evidence for such states in those areas until the middle of the 3d millennium B.C. Be that as it may, what is relevant here is that throughout the 4th millennium the south still had a clear and uncontested advantage (per unit of land) in the yield, reliability, and resilience of its primary subsistence resources. Uruk elites could therefore extract relatively larger surpluses per unit of labor than their contemporary counterparts in the north.

The third advantage of alluvial Mesopotamia was transportational efficiency. The cities of the alluvium were, in effect, at the head of an enormous dendritic transportation system created by the north-to-south-flowing rivers. This allowed them to procure information, labor, and commodities from areas within the vast Tigris-Euphrates watershed more efficiently than any potential upstream competitors or rivals away from the rivers (Bairoch 1988:11, 14). To be sure, exports from the alluvium still had to move by means of relatively inefficient donkey caravans following the course of the rivers northward, but the crucial edge of southern cities lay in their ability to import needed commodities *in bulk* from faraway resource-producing areas in the surrounding highlands at low cost, transporting them on rafts or boats downstream on the rivers, tributaries, and canals (British Admiralty 1917:291–92; Potts 1997:122–38; Sauren 1966). Of equal importance, the network of canals surrounding Mesopotamian cities and connecting them with the main courses of the rivers allowed them to move bulky agricultural commodities across their immediate dependent hinterlands with great efficiency (Weiss 1986:94). In contrast, societies in the Mesopotamian periphery had to rely wholly on less efficient modes of overland communication, such as donkeys or carts, both for their long-distance exchange needs and for the movement of subsistence resources across their immediate hinterlands. The natural transportational advantages of southern cities help explain, in part, why those cities could grow, on average, significantly larger and more differentiated than their peripheral counterparts throughout the Chalcolithic and Bronze Ages.[6]

A Synergistic Cauldron

The developmental takeoff of southern Mesopotamia in the 4th millennium B.C. can only be understood against a background combining the extraordinary transportational advantages offered by the Tigris-Euphrates fluvial system, the unique density and variety of the subsistence resources provided by the southern alluvial environment of the time, and the absence from that environment of other necessary resources, such as metals, timber, and status-validating exotics. The synergy created by these conditions spurred the creation of high levels of social and economic differentiation, promoted unprecedented

6. Early Dynastic Warka, for instance, was somewhere between 400 and 600 ha in extent (Finkbeiner 1991)—a size not reached by any city in northern Mesopotamia until Nineveh grew to the enormous size of 700 ha and became the center of the Neo-Assyrian empire in the 8th and 7th centuries B.C. (Stronach 1994). Wilkinson (1995) argues inductively, from pertinent survey evidence, that throughout the Bronze Age there was a 100-or-so-ha "natural" size limit for urban centers in Syro-Mesopotamia. He contends that the breaking of this limit that took place in Neo-Assyrian times was due to a combination of (1) more intensive coercive policies that increased the rate of surplus extraction from the countryside, (2) a resettlement program fueled by deportees from throughout the Near East that brought lands previously too marginal for agricultural use into cultivation, and (3) a more flexible economy that succeeded in overriding the until-then-normal limitations on population size in the north caused by the frictional effects of overland transport of bulk agricultural products.

population agglomerations within the alluvium, and selected for the creation of new forms of social organization and technologies of social control that until then had never existed in human societies. To understand why the ecological and geographical framework of Mesopotamia had such radical social consequences, we must briefly review the nature of urban development and its causes.

Particularly pertinent to this review is the work of the iconoclastic urban expert Jane Jacobs, whose ideas about the role of cities in human development have already influenced some anthropologists interested in the dynamics of urban growth in early civilizations (e.g., Kurtz 1987) and are now gaining increasing currency among mainstream economists (Nowlan 1997). Though Jacobs is best known for her often controversial views about the future of the urban experience in America (Jacobs 1961, 1984), her work also includes a variety of more abstract contributions about the nature of urban economies (1969, 2000) that are applicable to attempts to understand the dynamics of early social complexity in Mesopotamia. In the more theoretical aspects of her work, Jacobs is ultimately inspired by ideas first enunciated by Herbert Spencer well over a century ago. Spencer believed that a tendency toward increasing differentiation was inherent in all features of the universe, including the character of human societies. He argued that as societies became naturally more diverse through time, relations of interdependency were created among their diverse social elements and that this produced emergent properties that were not predictable a priori (Spencer 1967[1876,1882]: 8). In a similar vein but with a narrower focus, Jacobs sees economic differentiation as central to processes of social change and urban growth. For Jacobs, social differentiation results from economic differentiation, and social evolution ultimately depends on economic expansion. She is one of a small number of scholars who see human economies as sharing many characteristics with biological ecosystems (see also Mokyr 2000 and Ziman 2000 for in-depth discussions of similarities and differences between biological and technological evolution). The most salient of these similarities are that (1) the degree of resiliency and stability of the two types of systems and their ability to expand are directly related to the degree of diversity present (Jacobs 2000:22, 37); (2) expansion ultimately depends on capturing and using external energy, principally light in the case of ecosystems and exogenous resources in the case of human societies, and the more diverse means a system possesses for using, modifying, and passing around energy/resources, the larger the cumulative consequences to the system as a whole (p. 47); and (3) development takes place as part of a larger web of co-developments; the greater the internal diversity of the system, the more numerous and intricate the co-development relationships that will exist within it and the greater the number of emergent properties that will be spawned (pp. 19–22).

Given these similarities, for Jacobs the development of social and ecosystemic complexity is studied by exploring how diversity is created within the system, how resources external to the system are incorporated into it, and how developments that initially may have been independent join in inherently unpredictable and unforeseen ways to cause further differentiation. Jacobs explains that in both types of systems differentiation is an open-ended and self-amplifying process, since each new differentiation constitutes the basis from which further differentiation can eventually emerge. Expansion occurs as the processes generating diversity are repeated again and again.

More specifically, Jacobs argues that what determines a settlement's ability to grow is a positive feedback loop initiated by its capacity to generate exports by combining some of its imports or preexisting resources with human labor and capital. This generates economic diversity at the same time that it makes it possible for growing settlements to acquire more and different imports, some of which can again be used to generate further exports. This process creates co-developments in the form of an increasingly large, skilled, and diverse workforce (i.e., human capital), and this, in turn, creates the potential for further economic diversification by adding new types of work and new ways of working. As both work and diversity expand, so does population density within the affected settlements. This increase commonly takes place at the expense of nearby rural populations, which is why cities are always the economic and physical shapers of their hinterlands. Eventually, when their own market has developed sufficiently to justify producing some of the imports that had previously been acquired from other places, expanding settlements commonly have acquired both the skills and capital to do so. In this manner, by replacing imports with local manufactures in a second burst of economic expansion, growing centers generate even greater diversity and employment, thereby setting the stage for further economic and demographic growth and for an even sharper restructuring of settlement patterns in their immediate vicinity (Jacobs 1969, 2000).

While exchange between independent societies will always have an impact on all of the polities involved, the beneficial multiplier effects of the two-step economic process just described will disproportionally affect societies in which imports consist mostly of raw resources while exports consist mostly of value-added goods. This is so because economic diversity, employment, and skills expand doubly as a result of the need to process *both* the imports and the exports in those societies. This, in turn, is significant for the development of sociopolitical complexity in such societies because the division of labor generates incentives for cooperation between diverse individuals with common interests (Lichbach 1996), as well as incentives for competition between societal factions with conflicting or overlapping interests (Brumfiel 1994).

The export-driven model for social and urban development that Jacobs proposes is particularly applicable to the study of how and why early Mesopotamian civilization emerged. Cities and city-states were, in fact, the most typical and enduring political formations throughout the history of that civilization (Stone 1997, Yoffee

1995). Moreover, rich as the Mesopotamian alluvium may have been in agricultural, pastoral, and maritime resources, it still lacked a substantial proportion of the nonsubsistence material requirements for the highly stratified social systems that emerged there by the Uruk period (Algaze 1993). Thus, historically, the southern cities imported from highland areas on the alluvium's periphery many resources that required a significant degree of skilled processing before they could be incorporated into the economy. Most prominent among these labor-intensive imports were roofing-grade timber, wood, various types of metal ores, various utilitarian, semiprecious, and exotic stones, and bitumen, among others. Likewise, traditional exports from the southern cities, whether destined for other cities within the alluvium or for distribution in faraway markets, were also almost entirely labor-intensive and consisted principally of surplus grain, leather products, dried fish, dates, processed dairy fats, and, most important, finished textiles (see Algaze 1993:63–74; Larsen 1987; van de Mieroop 1997: 195–96; Yoffee 1981, 1995).

The production of textiles, traditionally the most important export from the Mesopotamian alluvium, provides us with a perfect case in point as to the applicability of Jacobs's model to the Mesopotamian context. As practiced in ancient Mesopotamia during historical times, textile production combined imports of wool from hinterlands surrounding individual cities with a substantial amount of human labor and capital to create commodities that were both consumed domestically and exported long distances. Textual and iconographic evidence suggest, in fact, that textile production was already an important urban industry in southern Mesopotamia during the second half of the 4th millennium. Many of the earliest pictographic tablets that appear by the end of the Uruk period (the Archaic Texts), for instance, deal either with the disbursement of finished textiles or with the acquisition of raw wool (Nissen 1986). By the same token, depictions in seals and sealings of female workers (pigtailed figures) attending horizontal looms are common in Uruk-period levels at a variety of sites (Amiet 1972:nos. 673–74; 1980:nos. 319–20).

However, our most detailed evidence for the importance of textile production to the economy of Mesopotamian cities comes from economic texts dating to the 3d and early 2d millennia B.C. These documents show that each major Sumerian city-state had a palace-organized weaving establishment in which thousands of dependent women and children labored to process wool imported into the city from the surrounding countryside into finished fabrics and garments (Jacobsen 1970[1953], Maekawa 1980, Waetzoldt 1972). The texts reveal that the amount of time and human effort spent in the production of these fabrics, earmarked for both domestic consumption and foreign markets, was astonishingly high. According to Larsen (1987), simple fabrics took almost a month to complete while particularly elaborate pieces, intended for export, took, on occasion, well over three years. Larsen's analysis of Old Assyrian texts of early-2d-millennium date clearly shows that the majority of the textiles that merchant families based in the northern Mesopotamian city of Assur exported to northern Syria and Anatolia were actually of southern Mesopotamian origin (i.e., "Akkadian"). Since the area around Assur was perfectly capable of supporting the necessary wool industries, the fact that Assyrian merchants felt compelled to import textiles from faraway polities in the south reveals how highly prized these southern Mesopotamian products were in the areas where they marketed their goods. No doubt this was partly the result of the superior workmanship and prestige of southern textiles, since the areas where those textiles were consumed, too, could have supported complex textile industries.

Once in place, the self-amplifying consequences of patterns of production and trade such as these are easy to visualize. First, the exchange would have promoted considerable economic differentiation and associated co-developments in the alluvium because of the need to process both imports and exports (Jacobs 1969, 2000). This, in turn, would have created incentives for the emergence of factions within growing southern polities and increased the likelihood of competition within and between them (Brumfiel 1994). Second, it would have stimulated the acquisition and maintenance of the (dependent) workers that, in a Mesopotamian cultural context, were needed to ensure the production of labor-intensive exports. Third, it would have spurred the expansion and institutionalization of the bureaucratic superstructure needed to organize and maintain the labor, to record its production, and to redistribute the resulting commodities across the landscape (Wright and Johnson 1975). Fourth, it would have promoted the development of steeper settlement hierarchies within the alluvium, since an adequate flow of local agricultural resources was required for export. Thus, the larger centers capable of conducting the exchange would have taken steps to attract and appropriate, by whatever means necessary, the agricultural and pastoral production of rural communities in their immediate hinterlands (Adams 1981:80–81).

What still needs to be clarified, however, is how export-driven economies in southern Mesopotamia evolved in the first place. What were the initial exports that brought in the initial imports, thus setting into motion the export/import positive feedback loops described by Jacobs? Here, I believe, is where the greater variety and density of subsistence resources offered by the southern Mesopotamian landscape and the particularly uneven distribution of some of these resources during the 4th millennium came to serve as necessary conditions for the Mesopotamian takeoff. The considerable agricultural, pastoral, and maritime resources of the area acted in effect as "unearned" imports, acquirable only through human efforts (Jacobs 2000:54). Exports of initial stocks of diverse "starter" resources in different concentrations throughout the Tigris-Euphrates lowlands were what allowed individual southern polities to begin to develop export-driven economies as a result of intra-alluvium trade before polities in surrounding regions could do so. In this manner, southern societies acquired a de-

velopmental head start over their neighbors which was neither planned nor foreseen but was to have long-term consequences for the developmental trajectories of both groups of societies.

The Evolution of Export-Driven Economies in Southern Mesopotamia

Although detailed evidence is still lacking, Jacobs's model allows us to visualize a still speculative though ultimately testable scenario to account for the precocious urban growth that took place in the Mesopotamian alluvium in the 4th millennium. In this scenario, the positive feedback economic loops responsible for that growth evolved over centuries as a result of exchange that was at first largely internal between growing southern centers and later complemented and amplified by a significant measure of external trade between those centers and less developed polities in the Mesopotamian periphery. For heuristic purposes, this evolving process may be divided into a number of discrete stages, although substantial overlaps clearly existed between them.

As already noted, the initial impetus for the growth of export-driven southern economies with their attending multiplier effects would have been inadvertently provided by burgeoning trade between polities exploiting the various rich ecological niches that existed within the Tigris-Euphrates alluvial lowlands during the Late Ubaid phase and the earlier part of the Uruk period (late 5th to early 4th millennium). Each of these polities would have naturally specialized in the production of a small number of crops or commodities for which it had a competitive advantage owing to its location within the alluvial ecosystem. Products traded in this initial stage would have included (1) woven and dyed textiles, goat-hair products, leather goods, dairy fats, and other pastoral resources distributed by polities situated at the margins of the better-watered parts of the alluvium, where they would have enjoyed preferential access to pastoral and nomadic groups producing these various commodities, (2) garden and grain crops produced by polities in the northern portion of the Mesopotamian alluvial plain, where the combined flow of the Tigris and the Euphrates made irrigation agriculture and horticulture both more likely and more profitable, and (3) dried, salted, and smoked fish, reeds, and other marsh or littoral resources preferentially produced by polities near the Persian Gulf littoral.

A second stage in the process would have been marked by an emerging elite awareness of the social implications of the trade patterns in place until that point in time. This stage was characterized by a decrease in regional specialization within the alluvium as each competing polity used the material surpluses and human skills acquired during the first stage to replace some imports from nearby centers by creating their own productive capacities for those products, thus setting in motion the further growth spurt that accrues from the import-substitution mechanism discussed by Jacobs. In this stage, competitive emulation would account for the diffusion of technologies and practices that were initially developed by individual centers exploiting specialized niches but soon came to be perceived as highly advantageous by many of the centers in competition. Foremost among these quickly diffused activities would have been the manufacture of textiles, an industry present in every Mesopotamian polity of any consequence in the 3d and 2d millennia B.C. Adding to the attraction of textiles is the fact that they lend themselves particularly well to the expression of the multiple statuses and local styles that are the natural outcomes of the processes of internal and regional differentiation described earlier (D. Tuzin, personal communication, 2000).

To be sure, some measure of trade with areas outside the Mesopotamian alluvium, allowing Mesopotamian polities to acquire needed utilitarian and exotic resources and goods not locally available, must have existed throughout this process. A case in point is the import of flint and obsidian obtained from areas on the periphery of southern Mesopotamia, which is attested throughout the Ubaid period in the south (G. Wright 1969). This case is important because it offers us what is perhaps the earliest example of import substitution within the alluvium, as imports of raw flint and chipped stone tools were partly replaced by locally manufactured clay sickles throughout the Late Ubaid and Uruk periods (Benco 1992).

Nonetheless, external trade becomes a significant factor in the overall economy of southern societies only in a third stage of the process, datable to the Middle and Late Uruk periods (ca. 3600–3100 B.C.). This stage was fueled by the material and human capital accumulated during the earlier stages of largely internal exchange. Specifically, what made possible the intensification of external trade at this time was the predevelopment and diffusion of industries that were originally intended to satisfy consumption requirements within the alluvium but easily adapted for export markets outside it. No doubt, woven and dyed textiles were the principal commodity fulfilling this double role in the 4th millennium, as they were later on in the historic periods. Other exports of the time are more easily documented in the archaeological record. These include bitumen from southern Iraqi and southeastern Iranian sources (Schwartz, Hollander, and Stein 1999) and processed agricultural (wine, unguents, aromatic oils?) and pastoral (animal fats) commodities contained within the various types of Uruk ceramic containers (four-lugged, spouted, and pear-shaped jars) that are often found in many indigenous Late Chalcolithic sites across the Mesopotamian periphery (Algaze 1993:63–74; 1995; Badler, McGovern, and Glusker 1996; Englund 1998:161–69).

This third stage of the process saw the establishment of various types of southern outposts at strategic locations of significance for transport across the Mesopotamian periphery. These outposts served as collection and transshipment points for the increasing amounts of peripheral commodities imported into the alluvium in the later part of the Uruk period and as distribution points

for the exports from the alluvium exchanged for them. The outposts need not be conceived as the product of a single "master plan." Rather, they are best considered as resulting from an organic process of action and counteraction, with individual Uruk polities scrambling to occupy specific positions in order to secure access to the critical lines of communication through which resources were obtainable and, of equal importance, to deny their local rivals such access (Algaze 1993, 2001; but see Johnson 1988–89, Oates 1993, Pollock 1992, Rothman 1993, Schwartz 1988, Sürenhagen 1986, Stein 1999, and Rothman 2001 for varying views about the nature and function of the outposts).

By the later half of the Uruk period, regular access to external resources became necessary because of the need to supply the increasingly differentiated and dense urban populations emerging in the southern alluvium. Imports of roofing-grade timber and copper (for the manufacture of cutting tools) must have been crucial at this point to satisfy the substantial building requirements of rapidly growing Uruk cities. It has been estimated, for example, that somewhere between 3,000 and 6,000 m of roofing-grade timber would have been necessary to roof the Limestone Temple at Warka (Eanna V), dated to the Late Uruk period (Margueron 1992).[7] This is but a single structure (albeit a large one: ca. 27 × 80 m = 0.21 ha) in a city that, at this point, occupied an area estimated at somewhere between 200 and 250 ha (Finkbeiner 1991). Equally important would have been a steady supply of precious and semiprecious stones and base and exotic metals, which, like some of the better-made textiles, were needed to mark and legitimize the ever more diverse and unequal social statuses evolving within Uruk cities. Substantial amounts of such exotic materials have, in fact, been recovered at a variety of Late Uruk-period sites. A storeroom with various types of semiprecious stones (including several kilos of lapis lazuli) and some copper ingots, for instance, was found at Jebel Aruda, an Uruk outpost in northern Syria (Rouault and Massetti-Rouault 1993:435). Even more impressive was the hoard of exotic and semiprecious stones used as inlays in furniture recovered from the Riemchengebäude structure in the Eanna (Level IV) precinct at Warka, which may represent either a temple (Forest 1999) or a storehouse associated with a nearby temple (Nissen 1988).[8]

While the great majority of imports into the alluvium throughout the 4th millennium required some degree of processing, it is likely that some finished goods made of exotic materials were also being imported at this time. These would have been made by peripheral societies with a long tradition of extracting and working those materials in areas close to the pertinent raw materials (Kohl 1987*a*:16). Cases in point are provided by a small number of elaborate obsidian vessels found in layers under the White Temple at Warka (Heinrich 1937:pl. 59) which closely resemble examples found in Late Chalcolithic tombs at the small northern Mesopotamian site of Tepe Gawra (cf. Tobler 1950:pl. 53 B-C) and which were almost certainly imported as finished products. Also in the same category is at least one javelin or harpoon-head made of an unusual copper-silver alloy (over 25% silver) found in the Riemchengebäude at Warka (Müller-Karpe 1991:109, fig. 3). This weapon is almost certainly imported from the Taurus region of Anatolia, since weapons made of the same type of alloy are common in Levels VIA and VIB at Arslantepe, a small Late Chalcolithic chiefly center near Malatya (Palmieri, Hauptmann, and Hess 1997).

However important finished imports may have been to the overall economy of Uruk city-states in the early phases of the evolving exchange, it is clear that it did not take long for further phases of import-substitution processes to take hold in the south. A case in point is provided by metals, which almost certainly were first imported largely as finished products. While evidence of metalworking and metal-processing installations in Uruk-period sites is still relatively rare, Moorey (1994: 243) attributes this paucity to the use of simple but effective technologies such as crucible smelting that have largely escaped the attention of archaeologists looking only for more substantial installations such as furnaces. Nonetheless, the pictogram for a smith (showing a smelting furnace with attached blowpipes) is already attested in the earliest Archaic Texts (Uruk IV script), which date to the very end of the Uruk period (Moorey 1994:243). Additionally, there are some archaeological indications that metal artifacts began to be produced locally in southern Mesopotamia during the Uruk period (still using, of course, imported raw materials). At Warka, for instance, both copper ores (Heinrich 1938:25) and a copper-processing installation (Nissen 1970:114) are reported in Uruk levels. Similarly, more recent excavations at several intrusive Uruk outposts in the Upper Euphrates portion of Syria have yielded substantial and clear indications for metal processing in Mesopotamian societies of the Uruk period. Tell Sheikh Hassan, for example, has provided evidence for smelting crucibles in a Middle Uruk-period level (Boese 1995:175, pl. 13a). From Late Uruk-period levels at Jebel Aruda, in turn, comes a hoard of eight copper axes (Rouault and Massetti-Rouault 1993:fig. 115), which almost certainly served as ingots (G. Stein, personal communication, 2000).[9] Finally, Habuba Kabira-süd, the largest intrusive

7. The large range in Margueron's estimate is due to the various potential ways in which the building could have been constructed (i.e., number of levels, whether the courtyard was roofed, and potential differences in beam interval).

8. It is also very likely that many of the exotics contained in the so-called Sammelfund Hoard, which was discovered in a Jemdet Nasr–period level (Eanna III) at Warka, were heirlooms of Uruk-period date (Heinrich 1936).

9. The axes in question were of more or less equal weight in spite of variations in size and were found in a storeroom that also contained a variety of exotic stones and minerals (Rouault and Massetti-Rouault 1993:435), suggesting that they were being categorized as raw materials rather than as tools. Buttressing Stein's suggestion that the axes served as ingots is the fact that the Mari texts of early-2d-millennium date actually refer to copper ingots in the form of axes (Yener 1980:32). Additionally, as Yener (pp. 34–35)

Late Uruk site on the Syrian Euphrates, has yielded evidence for the use of a fairly elaborate cupellation process to extract lead and silver from polymetallic ores imported into the site. These metallurgical activities are reported from several locations within the northeastern quarter of the site (Kohlmeyer 1997:447).

The Urban Takeoff of Southern Mesopotamia

How closely the emergence of social complexity in southern Mesopotamia followed the developmental path just suggested is a subject for future research. What is clear is that, by the end of the 4th millennium, substantial developmental asymmetries had emerged between societies in southern Mesopotamia and surrounding areas. These asymmetries are most easily gauged by a comparison of rates of population agglomeration in the two areas at this time. Although detailed and systematic survey coverage is still lacking for large portions of the north and northwestern periphery of alluvial Mesopotamia, there can be little doubt that throughout the 4th millennium southern Mesopotamia had a substantial advantage over areas on its periphery in the proportion of its population living in urban agglomerations and their immediate vicinity. Adams's calculations indicate that, depending on the area, somewhere between 40 and 70% of the total population in the Mesopotamian alluvium in the later half of the Uruk period lived in settlements that can be classed as towns or cities (i.e., 10 ha or larger; cf. Adams 1981:75, table 4). These results are now buttressed by a recent reassessment of the same data by Pollock (2001:table 5), who tries to correct Adams's data by counting only sites likely to have been occupied simultaneously during any one period. Her more conservative results suggest that the ratio of population living in agglomerated settlements throughout the surveyed portions of the alluvium during the later half of the Uruk period may have been even higher than Adams had originally reckoned (ca. 69–77% depending on the area).

The most telling example of the disparities in population agglomeration between southern Mesopotamia and peripheral areas in the 4th millennium is the city of Uruk, which, as already noted, had reached the extraordinary size of 200–250 ha by the Late Uruk period. Adams's (1981; Adams and Nissen 1972) surveys show that Uruk was surrounded by an irregular array of dependent towns and villages located within a 13–15-km radius of the city that accounted for an additional 280 ha of occupied settlement. This, of course, almost certainly substantially underestimates the actual population density of the Uruk countryside, since normal alluviation patterns in southern Mesopotamia would naturally obscure a large proportion of the smaller sites (Wilkinson 1990*b*). However one estimates the population of this megalopolis and its dependencies (see Postgate 1994 for a discussion of the pitfalls of estimating population densities in a Mesopotamian context), there can be no doubt that the Uruk city-state constituted the largest single agglomeration of population under a single ruler for its time not only in the Near East but in the world. Moreover, the city of Uruk was hardly alone within the Mesopotamian alluvium in the Late Uruk period. Multiple interacting urban sites (ca. 20–40+ ha) existed across the surveyed portions of the southern Mesopotamian alluvium at this time, all situated alongside canals and within relatively short distances of each other (Adams 1981). Additionally, at least two further Uruk urban polities existed in the Susiana Plain of southwestern Iran.

There is some debate about the nature of the political system within which these various polities existed. Flannery (1995) and Marcus (1998) explicitly assume that all pristine states emerge from a crucible of conflict as earlier regional chiefdoms are consolidated into a single much larger and complex polity. They suggest that Uruk was the capital of a territorial state by the Late Uruk period, pointing to the fivefold size differential between Uruk and its nearest second-tier settlements as supporting evidence. This is a plausible interpretation of the available evidence from the Mesopotamian alluvium, which, unfortunately, outside of Uruk itself, still consists largely of surface survey data. Equally plausible at this point, however, are interpretations that see the emergence of early Mesopotamian civilization as a case in which a number of rival statelets evolved in parallel as a result of common factors such as the multiplier effects of trade. From this perspective, the various urban centers across the Mesopotamian alluvium in the Late Uruk period are seen as independent polities ancestral to the competing city-states that characterized the area throughout the 3d millennium and for much of its history (Adams 1981, Baines and Yoffee 1998).

Of the two interpretations, I believe the latter is more likely. In the first place, processes of urban growth through the Uruk period appear to have resulted in the creation of buffer zones between some of the emerging urban polities of the time. These uninhabited areas suggest competition and strife rather than an overarching political unity. The clearest instance of this pattern is that documented by Johnson (1987) for the Susiana Plain. His surveys document the abandonment of all Middle Uruk–period villages along a 15-km-wide arc by the Late Uruk period, separating what appear to have been two rival states, centered at Susa and Chogha Mish, respectively. These sites thus appear to have been independent of each other and almost certainly were also independent of contemporary polities in the Mesopotamian alluvium.[10] In the second place, later literary traditions, such

points out, the use of standardized tool or artifact forms as ingots is well attested in a variety of ethnographic cases in Africa.

10. A further area of village abandonment can be observed between the northern (Nippur-Adab) and southern (Uruk) regions of the Mesopotamian alluvium surveyed by Adams (1981:compare figs. 12 and 13). Whether this can also be interpreted as a buffer zone between competing polities or sets of polities is, however, more ambiguous than the comparable case in Susiana because the area of the alluvium in question was one also affected by river course changes that may have contributed to the observed population shift (Adams 1981:63).

as the Sumerian King List (Jacobsen 1939), explicitly conceptualize the earliest Mesopotamian political configurations as composed of independent cities, each with its own ruler. If a primordial state centered at Uruk that held sway over the whole of the Mesopotamian alluvium existed in the Late Uruk period, it left no mark on later literary traditions that appear interested precisely in documenting, however fancifully, the flow of political power within Mesopotamia. Finally, political paramountcy is not the only thing that can account for the size differences between Uruk and smaller contemporary urban settlements. Steinkeller (1999) has recently called attention to a handful of Jemdet Nasr–period tablets showing individual Sumerian cities sending resources to Uruk as ritual offerings to Inanna. He sees these tablets as evidence for the operation of a precursor of the BALA distribution system that would keep the religious institutions of Nippur supplied with offerings and resources during the Ur III period, a millennium or so later. If this is indeed true, it means that Uruk functioned as the religious capital of Sumer through the 4th millennium, and, if later historical practice may be projected backwards, this would have precluded a political dimension for the city at this time.[11]

Leaving aside the nature of political systems in the Mesopotamian alluvium during the Late Uruk period, Adams's data clearly show that by that time multiple interacting urban settings had already characterized the Mesopotamian alluvium for centuries. In fact, his surveys of the Nippur-Adab area of the alluvium show that at least four separate 40+-ha centers existed along three separate branches of the rivers during the Early Uruk period (Adams 1981:fig. 13). To this must be added the site of Uruk itself, farther downstream, which was certainly of comparable size at this point. These centers did not exist in isolation. When the relevant survey data are tallied, it appears that complex three- and four-tiered settlement structures already characterized the surveyed areas of the alluvium by the Early Uruk period. These data indicate that the proportion of the population living in urban agglomerations in the alluvium at that time was already close to the 50% mark according to Adams's (1981:75, table 4) calculations. If Pollock's (2001:table 5) reassessment of the same data is preferred, that number is as high as 80%.

When the settlement structure of the Mesopotamian alluvium throughout the various phases of the Uruk period is compared with that of contemporary societies in neighboring areas, the contrast could not be starker. Admittedly, some individual Late Chalcolithic settlements of substantial size did exist in the Upper Khabur and Jebel Sinjar areas of Upper Mesopotamia, such as Tell Brak at somewhere between 40 and 65 ha in extent (Oates and Oates 1997, Emberling et al. 1999) and Tell Hawa at 30+ ha (Wilkinson and Tucker 1995).[12] However, those settlements were not embedded in complex settlement grids as southern centers were. Tell Hawa, for example, was surrounded in the Late Chalcolithic period by a corona of uniformly small village- or hamlet-sized sites (Wilkinson and Tucker 1995:fig. 35, *top*). A more complex three-tiered settlement pattern structure appears in the vicinity of Hawa and the Sinjar area only after the onset of contacts with the Uruk world (Wilkinson and Tucker 1995:fig. 35, *bottom*). A similar case appears to obtain for Tell Brak, which was clearly a substantial indigenous settlement during most of the 4th millennium (Area TW, Levels 19–13), before some sort of a southern Mesopotamian presence was introduced into the site during the Late Uruk period (Area TW, Levels 12–11; Oates and Oates 1993, 1994, 1997). The Late Chalcolithic phases of Brak have been described as documenting a regionally integrated urban polity comparable to but even earlier than those of Uruk-period southern Mesopotamia (Oates and Oates 1997, Emberling et al. 1999, Lamberg-Karlovsky 1999). This claim is based on the extent of the site in the Late Chalcolithic period, the fact that a small number of suburb areas where specialized production took place surrounded the site at the time, and the substantial nature of the architecture uncovered in the small exposures that have been practicable thus far in relevant levels (Area TW, 13–17 and 18–19). Nonetheless, the available survey evidence from the immediate hinterland of Brak, though much less detailed than that available from the vicinity of Hawa, shows that during the Late Chalcolithic period the site was surrounded by uniformly small village- or hamlet-sized sites (Eidem and Warburton 1996:59–60).[13] Unless larger dependent sites existed around Brak and Hawa that are thus far undocumented, the bipolar regional settlement pattern that characterized both areas lacks the depth and range of settlement size variability found to surround contemporary southern Mesopotamian urban sites and is most parsimoniously interpreted as reflecting a chiefdom-level organizational structure. Finally, recent attempts to characterize the Late Chalcolithic settlement of Arslantepe (Period VIA) as a state-level society (Frangipane 1997, 2001) are also unconvincing because of the small overall size of the site (4 ha) and the absence of detailed information about contemporary settlement patterns in its vicinity.[14]

The fact remains that when we look at those areas of

11. Nippur, the acknowledged pan-Sumerian religious capital of the Mesopotamian alluvium throughout the 3d millennium, was never a key political player during that time.

12. Often-repeated claims that the site of Hamoukar in northeastern Syria was 90 ha in extent during the Late Chalcolithic period (Sürenhagen 1986) are now discredited by recent work showing that its actual extent was but 13 ha (Gibson 2000).

13. The sites in question overwhelmingly appear to be 1.5 ha or less in total extent. The only exceptions to this are four sites containing Late Chalcolithic–period remains that vary in extent from 2.3 to 2.8 ha (Sites 23, 25, 29, 32) and one site that is 5 ha in size (Site 38). However, the actual extent of the Late Chalcolithic–period occupation of these latter sites cannot be ascertained from the published data (Eidem and Warburton 1996:56–60, fig. 2).

14. The one source available (Conti and Persiani 1993) lists numbers of sites but gives no indication of their extents or of the extent of occupation of the relevant period within them.

the Mesopotamian periphery for which quantifiable survey evidence is available—such as portions of the Euphrates basin in southeastern Anatolia (Wilkinson 1990*a*, Wilkinson in Algaze, Misir, and Wilkinson 1992, Algaze 1999, Algaze, Breuninger, and Knudstad 1994) and northern Syria (Wilkinson 1994, Danti 1997), portions of the Upper Tigris basin in southeastern Anatolia (Algaze et al. 1991), portions of the Upper Khabur basin of Syria (Stein and Wattenmaker 1990, Eidem and Warburton 1996, Kouchoukos 1998), and portions of the Sinjar plains of northern Iraq (Wilkinson and Tucker 1995)—we fail to find evidence for settlement hierarchies across the north in the Late Chalcolithic period comparable in scale and complexity to contemporary Uruk-period developments in the south. Moreover, whatever large Late Chalcolithic settlements existed across the north were essentially isolated from one another. The compact and long-lived systems of closely interacting urban settlements embedded in complex settlement grids which characterized the south during the various phases of the Uruk period simply did not exist in the less densely settled landscape of the Mesopotamian periphery at that time, and such systems would not arise in the periphery until the middle of the 3d millennium (Wilkinson 1994).

The Further Synergies of Density and Propinquity

Multiple consequences would have arisen from the differences in population density and distance between polities typical for southern Mesopotamia and areas on its periphery throughout the 4th millennium. One of the consequences of the greater density of population in towns, cities, and their immediate hinterlands of the south was the compounding of the natural advantages in transport efficiency of the alluvial environment by further savings in transport costs and efficiencies in communication arising from the increasingly compact arrangement of the inhabitants of the area. This, in turn, must have spurred further economic differentation and its associated multipliers, because, as Adam Smith (1954[1776]:bk. 1, chaps. 1–3) explained more than 200 years ago, gains in the efficiency of transportation and communication in human societies always act as a spur for division of labor, economic growth, and technological innovation. Additionally, greater density provided southern polities with a larger number of easily recruited laborers (for both agriculture and construction), craft specialists, soldiers, and potential colonists than could be marshaled by their less densely agglomerated competitors in the periphery. When coupled with the higher productivity per unit of labor in the alluvium and the higher reliability of that production, the larger pools of deployable labor in the south meant that Uruk rulers could extract and amass much larger surpluses than those achievable by even the most centralized of the northern polities.

Equally important for southern societies were the consequences of the greater concentration of polities that existed in the Mesopotamian alluvium throughout the 700-year-or-so duration of the Uruk period. As Colin Renfrew and his colleagues have repeatedly argued (Renfrew and Cherry 1986), the long-term presence of multiple polities within relatively short distances of each other invariably engenders important processes of competition, exchange, emulation, and technological innovation. The social evolutionary impact of these mutually reinforcing processes has been explained by Robert Wright (2000:165–68), who notes that in situations where antagonistic but mutually communicative polities exist, social and economic innovations that prove maladaptive in any one society are likely to be weeded out more quickly than in less competitive settings. Conversely, innovations that prove advantageous are more likely to spread quickly across the various polities in competition, thus accelerating the overall pace of change of the system as a whole.

The Domestication of Human Labor and Its Associated Technologies

The Jacobs model of urban development clearly explains how the geographic and environmental advantages of the Mesopotamian ecosystem promoted patterns of commodity production and exchange within 4th-millennium southern societies that led to the creation of more agglomerated and differentiated settlements than existed elsewhere. The same model explains how larger markets, larger pools of labor, new skills and new forms of work, and repeated opportunities for cooperation and conflict within and between polities were created in the south. These conditions explain why the final and ultimately most important asymmetry that existed between Uruk-period societies and communities on their periphery emerged. This was a disparity in the abilities of Mesopotamian and peripheral societies to resolve the inevitable managerial conflicts that large-scale population agglomerations entail, to store and process information (writing and associated reckoning systems), and to command and organize diverse labor pools. Here southern polities held a definite "technological" edge over their contemporaries that was, in effect, the sufficient condition for the crystallization of Mesopotamian civilization. This edge was made possible by important innovations in administrative technologies that took place throughout the Uruk period (H. T. Wright 1978). While this advantage would disappear in the 3d millennium as many northern societies adopted forms of social control and writing systems ultimately derived from southern models (Postgate 1988), in the 4th millennium Uruk polities were still more efficient than their neighbors in extracting labor from dependent workers and better at deploying those workers where most needed, appropriating their production, and converting their output into socially useful commodities.

Borrowing a page from V. Gordon Childe, we may use

the term "Labor Revolution" to describe this crucial combination of socioeconomic advantages. Underlying this transformation was a conceptual shift in the way some categories of human labor were looked at in southern Mesopotamian societies. Southern elites came to view and use fully encumbered laborers in the same exploitative way that human societies, over the immediately preceding millennia, had viewed and used the labor of domesticated animals. This represents a new paradigm of the nature of social relations in human societies. I suspect that a comparable shift in the way in which human labor is perceived (and exploited) is integral to all cases of early state formation, but in reality we do not know exactly when this perceptual change occurred in the Mesopotamian case. All we can say for certain is that it had already taken place by the end of the Uruk period, as can be observed in the Archaic Texts. Scribal summaries detailing the composition of groups of foreign and native-born captives used as laborers describe them with age and sex categories identical to those used to describe state-owned cattle (Englund 1998:176–81). Because these parallels are repeated in numerous texts, they cannot be explained away as either accidents or scribal idiosyncrasies. Rather, it would appear that the two classes of labor (captive "others" and domestic animals) were considered equivalent in the minds of Uruk scribes and in the eyes of the institutions that employed them. Early Near Eastern villagers domesticated plants and animals. Uruk urban institutions, in turn, domesticated humans.

In practical terms, the perceptual shift just described meant that Uruk elites probably had a greater variety of encumbered laborers at their disposal than did their northern counterparts, that they could extract more energy from those laborers, and, more important, that they were better able to organize them in nontraditional ways so as to take advantage of increases in productivity and other economies of scale arising from the specialization of individuals according to principles of comparative advantage (Snooks 1996:165). These qualitative advantages would have been magnified further by the sheer force of numbers. While available documentation is not sufficient to quantify the contribution of slaves, prisoners of war, and other types of encumbered workers to the economy of Uruk city-states with any degree of precision, it would appear that their number was significant. One recently published Archaic Text fragment (Uruk IV script), for instance, is a summary of several smaller individual accounts and refers to a total of 211 male and female captive laborers (Englund 1998:178–79, fig. 66). Admittedly, there is no way to know how representative this tablet is. However, a crude but perhaps useful measure of the relative importance of slaves and encumbered workers to the portion of the Uruk economy that was being recorded by state scribes may be obtained by looking at the number of individual attestations of the pertinent signs for the various categories of captive laborers in the Archaic Texts (5,820 complete and fragmentary tablets to date, including Uruk IV and III scripts). Robert Englund's (1998:70) comprehensive list of every known attestation of each nonnumerical sign of this corpus shows that the second-most-frequently mentioned commodity was SAL (female slave), with 388 attestations (for comparative purposes, barley, the most frequently noted commodity, had 496 attestations). To this must be added 153 attestations of laborers described as ERIM (captives) and 113 attestations of laborers described as KUR (male slaves).

A less direct measure of the importance of encumbered labor to the Uruk economy may also be available. Many of the Archaic Texts record disbursements of textiles and grain to individuals and presumably represent rations given to some sort of fully or partly dependent workers (Englund 1998:178–79, fig. 67). Again, the contribution of such workers to the Uruk economy cannot be gauged with any precision, but if we presume that Nissen (1970, 1976) is correct in assuming that the ubiquitous beveled-rim bowls were used as ration bowls, their incidence in southern cities, where typically they are found in amounts that defy quantification, suggests that the number of workers receiving state rations in return for their labor during the second half of the 4th millennium must have been quite substantial indeed. Access to pools of dependent labor of comparable scale does not appear to have existed in indigenous societies on the northern Mesopotamian periphery at this time. While redistribution of rations is attested to at some pertinent sites, most notably at Arslantepe VIA (Frangipane 1997) and Tepe Gawra VIIIC (Rothman 1994), the much smaller quantities of mass-produced bowls found at those locations suggests a much smaller number of individuals receiving rations than that typical for southern sites.

Similarly, there is ample epigraphic (the Titles and Professions List [attested already in Uruk IV script]) and administrative (seals, sealings, reckoning devices) evidence for both the extraordinary level of economic and social differentiation that had developed within Uruk societies and the depth of the controlling bureaucracy that had emerged in southern Mesopotamia by that time. When measured against this evidence, bureaucratic and administrative practices across the Mesopotamian periphery during the second half of the 4th millennium are found wanting. By the second half of the Uruk period, the south had greatly outpaced the periphery in administrative technology—in spite of the fact that sealed clay bullae, used as records of commodity shipments, had actually been in use in northern sites at a much earlier date (Halaf) than in any comparable southern context (von Wickede 1990, Lamberg-Karlovsky 1999). The "great leap forward" of the south over neighboring societies in technologies of social control and in economic complexity is brought into relief by the fact that no peripheral site has yet provided any evidence for the existence of formal reckoning and writing systems comparable in their complexity to those that had emerged in southern Mesopotamia and the Susiana Plain. This is most clearly seen when we compare accounting procedures in use within Middle–Late Uruk–period levels of sites such as Warka and Susa in the south (Nissen, Damerow, and Englund 1993, Amiet 1972, Dittmann 1986) and those in use in roughly contemporary Late Chal-

colithic-period levels at the sites of Arslantepe (Period VIA: Ferioli and Fiandra 1983[1988]) and Tepe Gawra (Levels XI–VIII: Tobler 1950, Rothman 1994) in the northern periphery. The thousands of sealings found discarded at various locations within the Period VIA complex at Arslantepe, for instance, commonly bear the impression or impressions of but a single seal. A similar case obtains in the Late Chalcolithic levels of Tepe Gawra. At both sites, impressions of more than one seal on a single sealing surface are exceptional (Fiandra 1994: 168; M. Frangipane, personal communication, 1999; M. Rothman, personal communication, 1999).

In contrast, contemporary procedures in Uruk cities in the south and in Uruk outposts in the north regularly exhibit the imprints of multiple seals, particularly in the case of balls and bullae (Delougaz and Kantor 1996). These differences are relevant because the number of impressions of different seals in a single sealing gives us a glimpse of the number of agents and, possibly, witnesses involved in the transaction. Additionally, if Nissen (1977) and Dittmann (1986) are correct in seeing the seals as encoding information about the hierarchical ranking of specific authorizing individuals and the institutions they worked for, then the much greater frequency of complex devices with multiple impressions of different superimposed seals in Uruk centers can be taken as a proxy for the greater number of levels of bureaucratic control and accountability that existed within those centers compared with the much smaller northern sites (Pittman 1993). The northern counterpart of the impressed balls and numerical notation tablets of the south is but a few tallying slabs at Arslantepe VIA, with evenly sized indentations on their surfaces (presumably representing numbers), which appear to have served as mnemonic devices (Liverani 1988[1983]:figs. 1–4). These devices could convey only a fraction of the information that could be transmitted by the more elaborate reckoning systems of southern societies at this time, which relied on complex combinations of numbers and images (seal impressions). Moreover, unlike the more complex southern systems, which were capable of conveying information at a distance and across time, the mnemonic systems of the north were incapable of communicating any information beyond their immediate institutional and temporal context.

The disparity in efficiency and complexity between the accounting systems of the two areas (and by inference the divergence in the scale and complexity of their economies) becomes even more marked by the very end of the Uruk period with the appearance of the earliest Archaic Texts in the south (Uruk IV script: ca. 1,900 out of 5,820 tablets and fragments [Englund 1998:86]). This took place at a time that appears contemporary with Arslantepe VIA on the basis of available radiocarbon dates (Wright and Rupley 2001). The new pictographic tablets of the final phase of the Uruk period not only gave southern administrators a way to record inflows and outflows of commodities in a form transmissible through space and time—as the earlier balls and numerical notation tablets had done—but allowed them to do so with much greater precision. More important, because the new pictographic tablets could also express nuances of time, location, persons involved, and action effected, they allowed Uruk scribes to convey a range of economic information that was at the time unprecedented. Moreover, the greater informational content and flexibility of the new tablets also allowed southern scribes to abstract and summarize detailed data about collections and disbursements of goods and labor in a form usable by themselves at a later time, by higher-level supervisory officials at any time, and by later generations of similarly trained bureaucrats. A final difference is that, although rare, the new lexical lists that also appear at this time (Uruk IV script) gave southern Mesopotamian scribes the ability to organize, categorize, and transmit information about their material and social world beyond that contained in the economic tablets that constituted the totality of earlier records (Nissen, Damerow, and Englund 1993, Englund 1998).

In short, by the end of the Uruk period, cumulative innovations in the ways knowledge was gathered, processed, and transmitted through time and space provided southern Mesopotamian decision makers and the urban institutions they worked for with a flow of varied and reliable economic data of the sort that is necessary for the formation, maintenance, and effective expansion of large-scale economies and social groups. More important, these data allowed Uruk elites to deploy available labor and goods where they were needed most in order to maximize their revenues, extend their power, and shore up the stability of the social system they were in the process of transforming. This furnished southern Mesopotamian societies with an important competitive advantage over contemporary neighboring polities, in which similar breakthroughs in accounting, accountability, and classification appear to have been absent. In fact, indigenous systems of administrative control equivalent in their sophistication to those used in southern Mesopotamia already in the second half of the 4th millennium would not be attested in the Near East until the rise of the Proto-Elamite state in southwestern Iran at the beginning of the 3d millennium and would not appear in Syro-Mesopotamia for at least 600 years or so after the end of the Uruk period—and when they appeared it was in the form of an imported technology that relied wholly on the cuneiform writing system and associated accounting procedures elaborated centuries before by southern societies (Postgate 1988).

Conclusions

In a recent review of the relationship between scale and complexity of social organization in cases of pristine state formation, Gary Feinman (1998) argues that the form such states take at the outset is largely dependent on the particular combination of factors most central to their creation. If this is the case, then geography, environment, and trade can be seen as the most important factors helping shape the initial nature of social com-

plexity in the Mesopotamian alluvium. Geography and environment would have been central not in a direct deterministic sense but rather in the sense that they provided the opportunities and incentives that made it probable that self-aggrandizing individuals and groups would use trade as one of the most efficient strategies at their disposal in their quest to achieve wealth, status, and power. Though we still lack much of the pertinent evidence for early trade in southern Mesopotamia in the ill-understood Late Ubaid and Early Uruk periods, it is not difficult to speculate on the impact that such trade would have had on the formation of early southern Mesopotamian cultural complexity. Trade would have been crucial because its varied and self-amplifying social ramifications would have created a situation in which the parallel development of multiple independent centers was a likely outcome. Each of these centers would have taken advantage of its particular location within the alluvial ecosystem to exploit a particular resource niche or a particular transportation route in and out of the alluvium, both on principles of comparative advantage. The localization of resources across the greater Mesopotamian landscape and the resulting salient role of trade, first internal and then external, in the processes of urban growth and state formation in the Tigris-Euphrates lowlands help explain why Mesopotamia became a civilization characterized by competing urban-centered statelets throughout most of its history and why the earliest political development of Mesopotamian civilization differs from that of other pristine civilizations (e.g., Egypt, Monte Albán, Moche), in which warfare and conflict appear to have been more important motors of social evolution than trade and unitary territorial states were the initial form of political organization (Marcus 1998). The same factors may also partially explain why the earliest Mesopotamian writing systems were almost entirely economic in their initial impetus, as opposed to the early writing of other pristine civilizations, which often was more political or religious in function.

We can only speculate about the historical consequences of the early political balkanization of the Mesopotamian alluvium, but many scholars see political division as an important factor selecting for accelerated social change. Patricia Crone (1989:161), for instance, argues that political fragmentation and interpolity competition were crucial for what she perceives as the unique vitality of developmental rates in European polities of the late medieval and early modern eras as compared with those characteristic of other areas of the world at that time: "Far from being stultified by imperial government, Europe was to be propelled forward by constant competition between its component parts." So, too, presumably, ancient Mesopotamia. However, the socio-evolutionary "critical mass" created by the compact and competitive social environment of the Tigris-Euphrates alluvial lowlands in the Uruk period was absent from neighboring areas at the time. Complex as some individual Late Chalcolithic polities may have been during the 4th millennium, they were essentially isolated. Claims that such polities were comparable in scale to the nascent city-states of Uruk Mesopotamia (Oates and Oates 1997, Lamberg-Karlovsky 1999) or that they possessed an equivalent level of organizational complexity (Frangipane 1997) incorrectly minimize the existence and importance of scalar and organizational asymmetries between southern and peripheral polities.

Arguments that minimize scalar differences gloss over the fact that, while some individual Late Chalcolithic sites in the north did achieve substantial size, as a group the Late Chalcolithic polities were no match for contemporary Uruk societies in the Mesopotamian alluvium either in terms of intrasite scale (extent and architectural monumentality) and complexity (social and economic differentiation) or in terms of the density, depth, and extent of their associated regional settlement networks. The number of individual polities in close proximity within southern Mesopotamia through the Uruk period was simply unparalleled. Further, by the second half of the Uruk period the large, walled urban polity of Uruk and its corona of dependent towns, villages, and hamlets were of a completely different order of magnitude from anything the periphery could offer. Also without counterparts in contemporary peripheral societies were the scale and extent of the public structures at the very center of Uruk at this time—the 8–9 ha of walled-off ceremonial and administrative buildings in the Eanna precinct and, in a separate part of the city, the massive Anu Ziggurat and associated temple, which towered over the site and the surrounding plain (Nissen 1988).

Arguments that minimize organizational differences pay insufficient attention to the constraints and opportunities of geography, the ways in which humans can exploit their environment to gain and expand their social standing, and the power of ideas. Such arguments commonly start from the premise that there were no essential differences in the material technologies available to the two groups through the 4th millennium (Kohl 1987*a*, Stein 1999). This premise is correct only in the narrow sense that the transportational and craft technologies available to both groups throughout the second half of the fourth millennium were comparable and misses the mark in four important respects.

First, the premise should be rejected on principle, for it implies that economic changes caused by advances in material technology are the sole force underpinning social change. This reductionist viewpoint fails to take into account the fact that technological innovation not only acts on society but is itself contingent on socioeconomic forces.

Second, it fails to take note of the geographical advantages in transportation of the southern alluvium over neighboring areas. If, as Jacobs argues, a key cause of development is imports added to capital and labor which produce value-added exports, then southern Mesopotamian societies had a substantial and irrevocable advantage over peripheral polities in that both labor and capital (agricultural, pastoral, and piscatorial surpluses and status-marking exotics) were more easily mobilized and redistributed in the south than elsewhere because of the

inherent superiority of southern water-borne transport systems.

Third, it fails to acknowledge the environmental advantages in productivity of the southern alluvium over neighboring areas, advantages that were particularly pronounced through the 4th millennium. These advantages provided the opportunities that elite groups exploiting the alluvium's rich and diverse ecological niches needed to amass the initial surpluses that set in motion the export-driven economies that characterized southern Mesopotamian polities throughout much of their history. These groups neither understood nor foresaw the consequences of the exchange patterns they initiated. Rather, they were merely attempting to do what elites naturally do in all human societies, namely, sanction existing social inequalities, legitimize their right to continue demanding and receiving unequal access to resources, maximize the amounts and varieties of commodities and labor at their disposal, and increase their political power. The richness of the ecological context of the alluvial lowlands of the Tigris-Euphrates system of the 4th millennium made such attempts both more likely and more likely to succeed than would have been the case in less resilient environments.

Fourth, and most important, it overlooks the fact that differences in ideologies of social organization and in associated technologies of social control are as capable of creating significant developmental asymmetries between societies as are imbalances in material technology (Goody 2000). By the second half of the 4th millennium southern Mesopotamian societies enjoyed a variety of revolutionary organizational advantages not possessed at that point by any of their contemporaries. These advantages partly fall in the realm of what Jack Goody (2000) refers to as "technologies of the intellect," what Michael Mann (1986) terms "technologies of power," and what John Baines and Norman Yoffee (1998) refer to as "high culture." The most salient of these advantages were the conceptual shift earlier described as the "Labor Revolution," novel and much more efficient procedures of information recording and processing, and economies of scale arising from the specialized production of commodities by dependent laborers organized according to principles of comparative advantage. When added to the aforementioned advantages in the number of potential laborers, compactness, and ease of transportation, these organizational innovations gave Uruk societies an important edge over neighboring polities.

In other words, by the second half of the 4th millennium, cumulative gains in economic and social differentiation arising from centuries of asymmetrical exchange patterns and import-substitution processes had created societies in the Mesopotamian alluvium that were not only substantially larger in scale and regional reach than their contemporaries but intellectually better prepared to deal with the complexities of supporting large-scale agglomerations of population as well. They were also more capable than their neighbors of resolving the inevitable managerial conflicts that such agglomerations entail and managing multiple contacts with far-flung societies in control of coveted resources. The various ideational technologies of social organization that made this possible were certainly selected for and thus made more likely by the multiplier effects of the export-driven economies that had taken root in the rich and diverse environmental framework that characterized the southern Mesopotamian alluvium during the formative stages of Sumerian civilization. As Jacobs (2000:63) notes, diversity expands naturally in inherently rich environments, which are made richer by the diverse use and reuse of received energy.

As rules of historical development would have it, the initial southern Mesopotamian edge in ideational technologies of socioeconomic organization and control did not and could not last long. With disparity in organizational complexity came disparities in power, both real and perceived, and with them came opportunities for the expansion of Middle and Late Uruk–period polities by means of colonial outposts at strategic locations across the Mesopotamian periphery. In great part as a result of processes of competitive emulation initiated across the Mesopotamian periphery by the Uruk expansion, Subarians (Gelb 1944, Michalowski 1986), Hurrians (Gelb 1944, Steinkeller 1998), Elamites (Carter and Stolper 1984), and other 3d-millennium groups (Sollberger and Kupper 1971, Grayson, Frame, and Frayne 1987, Hirsch 1963, Lebeau 1990) were soon to master for themselves the fine art of creating truly effective social systems of the few, by the few, and for the few. This, too, was an opportunistic adaptive response on their part but one which was promoted largely by a social landscape and historical context that had been dramatically transformed by the earlier emergence of Sumerian societies.

Comments

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The main thesis of this paper—the importance of trade in the early phase of civilization in Mesopotamia and especially the interrelation of society and ecosystem—can be accepted, but there are some details which can be questioned:

1. Algaze insists on the absolute primacy of southern Mesopotamia as the nucleus of world civilization, but the beginnings of the development in the Indus Valley and farther east may not have been later than the late 4th millennium B.C. and did not depend on Sumer.

2. Algaze stresses the importance of the availability of natural resources in southern Mesopotamia, and this is correct, but no less important were the shortages of raw materials—wood, stone, and metals—that forced the pursuit of imports.

3. The role of climatic changes cannot be denied, but the monsoon from the Indian Ocean, which was turned more to north than today, brought rain to the Indus

Valley, Baluchistan, and Afghanistan and not to Mesopotamia, far to the northwest. The Indian Ocean monsoon that reached southern Arabia first moved west, was diverted to the north, over Ethiopia, crossed Yemen, and reached Oman and other countries from the south. It cannot have been important for irrigation in Mesopotamia, which depended on precipitation over Asia Minor and northwestern Iran and received its winter rain from the northwest. If there really was summer rain in southern Iraq, it might have had sources in the northwest, too.

4. I doubt the inefficiency of caravans, given the traffic from Assyria to Asia Minor in the early 2d millennium B.C.—and why they should have used their boats only downstream? It would have been inefficient to return the boats empty or on donkeys, and dragging or rowing is quite possible. The Mesopotamian (and Elamite) trade to the east and the overland trade of the Indus civilization crossed high mountains and steppes for thousands of kilometers up to the Ferghana Valley and to Chorezm.

5. It would have been useless to carry bitumen from southern Mesopotamia to the north—the area of Mosul had enough for export itself.

6. Algaze does not mention Uruk's dual structure, with two central temples instead of one as usual in Sumer. Was it a combination of two former nuclei as some believe?

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This is certainly a very interesting assessment of the opportunities offered by the environment to the leaders of both northern and southern Mesopotamian communities for the amplification of the potential to usher in major social transformations. The advantageous starting position of the south is well argued, and I hardly believe that any modern scholar would contest the logic of Algaze's conclusions. The crux, as I see it, is why.

What would have induced the southerners to apply so much energy to embarking on a journey that is well known to us but absolutely original, new, and therefore potentially dangerous for them? I am more and more convinced that the truly revolutionary changes and transformations take place in human heads and, at that, in the beginning in a single one. A promising environment will hardly fulfil its potential if the humans living in it simply do not perceive this promise or prefer their traditional way of life to something that might be advantageous but conflicts with traditional norms and customs. Asked why they would not engage in agriculture, the San of the Kalahari simply replied, "Why should we work in the fields if there are so many mongongo nuts in the world?" This response is fairly typical for prestate and preindustrial societies. Humans had lived in southern Mesopotamia for millennia prior to the Late Uruk period, and no traces of the multiplier effect proper to the latter culture can be observed in the evidence it left (at Tell Awayli; see Forest 1996). My own studies (Charvát 1993, 1997) have pointed to the conclusion that the economic base of the Late Uruk elite was so diffuse and lacking in any visible signs of having been organized intentionally from a single central point that it gives the impression of the elite's having adjusted to the existing complexities of the community's subsistence activities rather than developing its own distinctive entrepreneurial culture.

There is, to be sure, one innovation that might have caused the Late Uruk elites to turn towards exploitation of the full potential of their host landscapes, and this is a purely spiritual one. The belief that the fertility of nature will be fully realized only if it is "triggered" by the NA2 ceremony (probably a predecessor, or possibly an ancestor, of the "sacred marriage rite") performed by the pontifical couple, the EN and the NIN, seems to represent an invention of the (Late?) Uruk period, as I shall be arguing in my forthcoming study of the iconographical sources for the emergence of statehood in the ancient Near East (see also Charvát 1997). I believe that the Late Uruk phenomenon was a revolution of human souls and minds rather than of hearts and stomachs.

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The origins and early evolution of government—in Mesopotamia, China, Peru, and Mesoamerica—are among the most fundamental puzzles in political science, although in recent decades such investigations have tended to gravitate towards the disciplines of archaeology, anthropology, or anthropological archaeology. It is therefore intriguing and stimulating to see these puzzles addressed by modern scientific scholars such as Guillermo Algaze. Significant advances by archaeologists investigating the origins of government in ancient societies, especially when produced through comparative and interdisciplinary methodologies, are crucial not only for archaeological theory and research but also for political science and allied social sciences.

As a political scientist who shares many of the scientific interests as Algaze and his colleagues in archaeology, I must applaud his systematic effort to gather data, formulate hypotheses, and rigorously test theories of the origin and early evolution of political complexity. Since we have the same basic epistemology, albeit not the same disciplinary background, I shall focus my comments on a set of political science issues aimed at providing some plausible suggestions for further theoretical and empirical development.

I find the model developed by Algaze in this study, including his emphasis on the causal role of physical ecological variables, essentially correct but somewhat incomplete in a number of aspects. That is to say, "the story" is still missing a set of critical events that should be added for a deeper understanding of government formation. As some readers and Algaze himself might an-

ticipate, the missing elements are political, not environmental, although this is not to say that political scientists have done a good job of highlighting and explicating these missing political pieces of the puzzle with the necessary scientific precision.

In essence, environmental variables and events such as those identified by Algaze (and Adams) are best seen as remote (or "ultimate") causes of the origins of political complexity, whereas political variables and events, including mechanisms of decision making, are best seen as "proximate" causes of political complexity. The formation and maintenance of government in any given society constitute a process or sequence of contingent events. Foremost among the political events embedded in the process of government formation, whether in ancient Mesopotamia or elsewhere, is what political scientists, economists, and sociologists call "collective action," which is not a physical event although it may be related to or ultimately caused by prior or contemporaneous physical events. In this context, collective action is caused by the emergence of leaders (elites) and followers (commoners) that jointly produce a system of government. In turn, both leaders and followers emerge by a variety of processes or mechanisms, including decision-making calculations. For example, the actors involved may undergo a decision-making calculus of costs and benefits (the so-called rational-choice model) or may decide to act through other mechanisms (such as deontic obligation or instinctive responses to social or physical environmental stimuli). Although this is not the appropriate venue in which to detail a collective-action process of government formation with the desirable rigor, suffice it to say that a system of government cannot form without leaders' and followers' solving a collective-action problem. Moreover, such actions sometimes succeed and sometimes fail, as archaeologists have documented for many cases.

Besides key ideas from the theory of collective action, including Lichbach's (1995) important new work cited by Algaze, other key pieces of the puzzle of government formation include the classical choice-lottery distinction from decision theory and game theory, the opportunity-willingness principle (Cioffi-Revilla and Starr 1995, Starr 1978), and principles of political uncertainty (Cioffi-Revilla 1998). For example, the first of these is used for parsing the complex process of government formation into "states of Nature" (produced by lotteries) and "human acts" (produced by decisions or games). Each of these, in turn, is modeled by specific variables and events. The opportunity-willingness principle is used for modeling human acts subject to environmental constraints, such as climate change, resource availability, and other significant conditions discussed by Algaze. Principles of political uncertainty specify the dynamics produced by probabilistic causes, often in counterintuitive ways, such as the effects of multiple decision mechanisms on leaders' and followers' choices in the emergence of political complexity.

The emergence of political complexity in Mesopotamia between the 6th and 3rd millennia B.C.—the rise of chiefdoms, states, and eventually empires—was a process of fundamental importance not just for archaeology and political science but for virtually all areas of human knowledge. Studies such as Algaze's give us solid hope that we may be close to some important new breakthroughs in scientific explanation and understanding through greater interdisciplinary collaboration.

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21 XI 00

Having worked on aspects of the Uruk period, I have found it fascinating to read this stimulating and excellent paper. I have always viewed the Uruk horizon as part of a *longue durée* development from the Ubaid to the Early Dynastic and finally the Akkad and Ur III complexes. Therefore, as I see it the Uruk, especially the Late Uruk complex, is to some extent the culmination of the Ubaid development and in many respects the beginning of the processes that led to the Early Dynastic and later aspects. Consequently I never use the term "colonies" for Uruk settlements outside Babylonia, because for most of Greater Mesopotamia the Uruk is simply the only complex that existed at this period, with nothing local in the immediate neighbourhood (sites such as Habuba, Gebel Aruda, and earlier Tell Sheikh Hassan, Tell Bleibis, and others but of course not Godin, Hacinebi, or Arslantepe). Our understanding of the network of Middle and Late Uruk sites, especially in Syria and southern Turkey, is focused on settlements along the Euphrates; almost nothing is known about its hinterland. We have sites—and very strange ones—that are very small, like farms (for example, Shavi Höyük II, Nevala Çori, and sites in the Incesu Valley). Further, Hassek Höyük is really not, in its structure, a settlement in the sense of a village. In order to understand the Uruk network, then, we should look at each site and try to understand its structure and possible function within the system, and we should investigate the hinterlands of the major river systems. If we do this, I am convinced, we will find a lot more variation in the Uruk system. I suspect that Algaze's claim of an imbalance between southern and northern sites will be complemented to some extent in the future by a deeper understanding of the complexity within the system. This definitely requires much further study.

Algaze's suggestion that the Late Uruk period is already characterized by a system of separate and possibly competitive city-states seems not impossible to me. It is obvious from the glyptic material available at the moment that we have many "conflict scenes" at Uruk but almost no "economic scenes," the latter being found almost exclusively elsewhere (signs of a kind of dendritic economic network?) This could be a hint of what Algaze suggests in the sense that Uruk, as the religious and economic centre, may have tried to dominate smaller emerging centres at the end of the Uruk period by force

in order to prevent centrifugal processes within the system. The almost canonical representations and motifs of the Uruk glyptic on the whole seem to me to reflect a former (Middle and beginning of Late Uruk) high level of integration in the Uruk system not only economically but surely also ideologically. In this respect it would be understandable that the quality of the representations on Uruk artefacts is comparable in naturalism and realism only to that on Akkadian ones and that the motifs have an almost unlimited geographical distribution. The Uruk system seems to have had a panregional understanding of the "four corners of the world," and this, I suggest, was at once the legacy of the long Ubaidian development and the romantic goal of the later, regionally limited political systems. With the collapse of the Uruk system, the iconological uniformity broke down as a result of the increasing development of local symbolic systems by the emerging—or consolidating—neighbouring city-states. The form changed, but the contents of the iconography of the Uruk period became an essential part of the Greater Mesopotamian symbolic complex.

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This substantial systematization of argument and data on the initial emergence of southern Mesopotamia is sure to take its place as a timely contribution to the issues. The author argues that the reason "civilization" emerged in the southern alluvium is that this zone provided a set of comparative advantages that led to a synergetic development that could not be matched in other parts of the Near East. It reintroduces the once very popular issue of ecology and environmental factors not in the usual cultural materialist or determinist way but in one close to the general arguments that developed within certain versions of structuralist Marxist and later global systemic anthropologies. Concentrating on recent and not so recent data on resource diversity and stability, relative productivity, and ease and therefore productivity of water transportation, Algaze argues that the conditions for increasing density, differentiated economies, trade, and competition were quite special to this area. This statement of the approach is basically selective, expressed as distributions of constraints and, as he writes, opportunities. The simplest form of the argument is that the same strategy succeeds differentially in different initial situations and that southern Mesopotamia is the most advantageous place for things to kick off. This assumes that the strategies, let us say, of accumulation, expansion, etc., are basically the same, so that the environment becomes crucial in locating the initial takeoff. Is this what is meant here? In other parts of the article it is suggested that there are significant social and cultural differences as well, but it is not clear what their role may have been. Some of these are translated into technologies, technologies of power, related to the forms of literacy, administrative organization, etc., but are these regionally specific differences or effects of the development process itself? The argument is not clearly spelled out here.

Trade is taken up as a factor in this argument, equivalent in a sense to geography and productivity, but this is, we suggest, a misconstrual. Accumulation of wealth based on trade is not a mere factor that can be listed along with environmental and other conditions, since this underplays the systemic relation between trade, technology, slavery, expansion, and almost all of the other "factors" mentioned. Jacobs's model of export-led growth is not, of course, new or even specific to Jacobs, although she had the daring insight to apply it to ancient urban economies as well as to modern ones. As we understand the use of this model, it entails that an elite has a specific strategy of accumulation of wealth, status, or something that requires economic growth, a "something" specifically social and cultural that is not specified here. The model is based on modern Western capitalism, and it is not clear that it is applicable to the early city-state without a further argument, which we have also made, for some basic similarities. In any case, this dynamic is not a mere factor that enabled the emergence of Uruk but the very form of that development, one that organized geographical, technological, and other factors in an expanding system.

For anthropologists a crucial question here would be the actual organization of this dynamic—its sociocultural form. Quite a few years ago we suggested that this kind of export/import-based economy might have grown out of an earlier regional system based on a strategy of monopolizing the circulation of prestige goods. While we don't necessarily want to defend such a model today, we would stress the ultimate need at least to attempt a more specific characterization of the social processes involved. The resource-differentiated southern plain may indeed have afforded an arena for intensification of trade, but there is evidence that more far-reaching trade was also present from the earliest periods. An aspect of the discussion that we find most interesting is the suggestion of a tendency toward import substitution in the takeoff period of urbanization. While this is a normal phenomenon in modern capitalist economies in their protectionist phases, it may also, in this case, mark a major transformation of items prestigious because of their foreignness into more mundane practical ones, that is, the emergence of an increasingly commercial economy. In order to make any such suggestion, however, we need to know how the goods are distributed or not distributed.

The entire region including northern Mesopotamia is characterized by the early existence of regional trade, by tendencies toward the use of slavery, and by similarities in urban formation. Are we dealing here with a common structure that becomes differentially organized along something like center-periphery lines, in which the centers and even the centrality of regions shift over time? The fact that city-states develop throughout the entire

region raises a number of questions, such as the nature of initial conditions in these later contexts and the import of the explanatory model if we do not assume that this social organization simply diffused.

If this is the case, then it might be profitable to work out a dynamic model for the region, one that tends toward the formation of commercial city-state systems of intensive wealth accumulation. The contrast with areas such as Egypt and even South America suggested here may have to do with the historical specificities of a vast region between the Mediterranean and South and Central Asia in which trade may have been decentralized from a very early period, with the result that pristine territorial states would have been unable to establish a monopoly over the flows of wealth in the region—a situation that could be overcome only by empire formation. Decentralized conditions of accumulation have been argued to have been crucial in the development of Western Europe.

Algaze makes crucial progress toward a more adequate understanding of Mesopotamian development, and our questions, typically anthropological, press for more specificity if possible. Yes, by and for the elites, but what are they up to?

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In this stimulating, nicely written essay, Algaze returns from fieldwork in the periphery to synthesis in the core ("heartland") of Mesopotamia, a subject area he knows well and one in which, increasingly, he plays a leading interpretive role. At the outset he quotes R. McC. Adams to the effect that contemporary archaeologists—in the throes of a social archaeology—no longer see fit to examine the interrelationship between natural ecosystems and human beings. It seems odd to read this, coming out of the American anthropological tradition in archaeology, where the environment has loomed large for an entire (processual) generation and continues to do so (at least from my European vantage point). Perhaps, though, this is a perspective more specific to Near Eastern archaeology as taught and studied in America; given the diversity of material culture and texts associated with such levels of social complexity as are found in Mesopotamia, the singularly ecosystemic approach of anthropological archaeology never worked very well anyway. Or, perhaps, Adams (and Algaze) might have benefited from looking more closely at work being conducted elsewhere in Europe (the Old World), in particular at longstanding traditions in regional survey and rural archaeology in the Mediterranean, where the dynamic between people and their environment, between tradition and innovation, between urban and rural, has long held sway (e.g., Ward-Perkins 1964, Cherry, Davis, and Mantzourani 1991, Barker and Mattingly 1999–2000).

Employing an eco-environmental approach in the attempt to understand past peoples and societies has long been integral to both archaeology and anthropology. Critiques of environmental determinism stem in part from realizing that social patterns and human activities were affected by diverse and interrelated factors, not just adaptation or reaction to the environment. The inclusion of social theory in archaeology helped to bring about a more nuanced understanding of the ways in which the environment impacts and is impacted by human action. Social approaches also adopt an interpretive framework based on the irreducibility of the human-environment relationship, itself framed and characterized by human-ecodynamics (McGlade 1995) rather than by some self-regulating, equilibrium-seeking system.

Eco-environmental approaches are widely regarded as being reductionist or deterministic, but often the critique of reductionist models or assumptions is presented as an either/or proposition: either you use reductionist models and underdescribe the reality of the past or you accept the inability to know the past because of its ramified and situated nature. In fact reductionist models are a first step towards a nuanced description of the past: they require a data set to which they can be applied, and regional survey often forms a critical component of creating such a data set.

Algaze draws in part upon the rich regional survey data accumulated for the Mesopotamian lowlands by Adams, reassessed more recently by Susan Pollock. He also draws upon a wealth of other field data—site reports, clay bullae, Archaic texts from Uruk and cuneiform records, iconographic evidence, satellite imagery, and more—to substantiate his main thesis, namely, that the development of a primary, complex state-level society in southern Mesopotamia during the mid-4th millennium B.C. should be understood as a technological innovation, one spurred by social and economic differentiation, unequal exchange, and import substitution. Within the "periphery" of northern Mesopotamia/Syria, southwestern Iran, and elsewhere, such developments came only later, during the 3d millennium B.C. The spatial and environmental situation of the alluvial south gave it pride of place in the region and, together with informational and managerial developments ("ideational technologies"), helped to ensure that Sumerian élites maximized all the resources at their disposal in establishing and perpetuating their own rule.

As we found in attempting to set the stage for a series of papers on archaeologies of landscape (Knapp and Ashmore 1999: 12–13), "ideational" is a term at once comprehensive and vague; it has been equated with everything from the sacred landscape to landscapes of the mind. Algaze's use of the term seems to me much more coherent and meaningful when applied to the technologies and organizational advantages discussed in his paper and is certainly preferable to the alternatives he mentions—technologies of the intellect (Goody), technologies of power (Mann), or "high culture" (Yoffee).

Algaze's essay is a substantial and engaging contribution to contemporary archaeology. It succeeds in combining spatial, environmental, empirical, and social pa-

rameters in a thoroughly readable (and to me convincing) essay on the emergence of socially complex early Mesopotamian culture, one that all archaeologists would benefit from reading.

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7 XI 00

While disavowing geography as destiny, Algaze privileges three environmental/geographic "advantages" in southern Mesopotamia: (1) "a denser and more varied concentration of exploitable subsistence resources," (2) "the higher and more reliable agricultural yields," and (3) the efficiency of transport allowed by the river system. His discussion of these three items and the complexity of their interaction with the social order is the most compelling part of his thought-provoking essay. There is both teleology and tautology in this argument: environmental benefits bring about social complexity while, in turn, social complexity is able to take increasing advantage of its environment. Environments present constraints and restraints. The richness of an environment does not ensure the transition to cultural complexity. Environments are filtered, transformed, and given their material reality by the beliefs and practices of a society.

The emphasis in this essay is on complexity and its mechanisms, not on society. Algaze refers to the Eanna precinct but does not credit it with responsibility for structuring the social organization of the city of Uruk. The temples with their resident bureaucrats were the center of an administrative bureaucracy utilizing and in some cases inventing and/or perfecting what I have called a technology of social control—writing, seals, sealings, and standard units of measure—to manage labor and monitor the production, consumption, and redistribution of goods. Algaze speaks of "ideational" technologies but nowhere expands upon the structures of belief that organized and gave meaning to both the social and the natural environment.

The organization of people is effected by concepts, and these differ in different societies. The organization of tribal societies and chiefdoms structures a political community based on kinship, and this organization is entirely comprehensible. The structure of an emerging state is very different; I do not know of a single one that was not formed by recourse to the supernatural. In southern Mesopotamia the gods owned the land, lived in the temples, and presided as patrons over the city. The EN (chief bureaucrat), as a steward of the gods, was responsible for feeding both the gods and the people of the community. The sacred Eanna precinct was home to bureaucrats whose authority was legitimized by the gods. The structure of the relationship that legitimized these bureaucrats was as important a "feedback loop" and "synergy" as the relationship of exports to human labor and capital or of population agglomerations to settlement hierarchies discussed by Algaze. In this regard the views of Sahlins (1974:68) on why state complexity did not emerge in Polynesia are directly relevant:

> Had the Polynesian gods been more demanding, temple building might well have generated new social and political roles here as it did in Sumeria; but for one reason or another they were too complacent. One suspects that they were too complacent precisely because a perfectly satisfactory tribal system existed; differently put, one suspects that state structures emerged among the Sumerians all the more easily in that no tribal organization had been developed.

Gods should not appease, and bureaucrats must be demanding if they are to establish exploitative central-place coercion. What Algaze refers to as "the Labor Revolution" has a distinct social setting—the subordination of the population by divinely sanctioned rules written by the bureaucratic elite.

Algaze appears to find positive value in hierarchical settlement patterns, writing, and complexity. The perception of each in the past, however, may have been different from what it is today. (1) In southern Mesopotamia settlement hierarchies went unnoticed. There are no words distinguishing city, town, and village; *uru* simply designated a place, without distinction as to its size. In an effort to emphasize the correlation of settlement size and complexity Algaze notes that Uruk was, in its day, the largest community in the world. Not so! The Tripol'ye Culture in Ukraine, dated to the first half of the 4th millennium, had several communities of equal or larger size, among them Dobrovody (250 ha), Majdaneckoe (270 ha), and Tal'janki (400 ha). While these communities were as large as the later Mesopotamian city-states, they did not endure as long or reach the same level of social complexity. By the middle of the 4th millennium Uruk, at 250 ha, was a city of substantial complexity, while Tal'janki, at nearly twice its size, maintained a level of complexity characteristic of village life. Settlement size, like hierarchy, is significant only in the context in which it is situated. It is not a universal attribute which alone signifies complexity. (2) Writing originated as a tool for controlling labor, production, consumption, and redistribution. The unanticipated consequence of its invention was the poetry, hymns, reports of divination, and king-lists that were to appear some 500 years later. (3) Valuing complexity merely articulates a belief in cultural evolution, the placing of one stage upon another, often without accounting for the *social* mechanisms responsible for the transitions between them. Social complexity requires permanent institutions whose authority emanates from specific ideologies. In southern Mesopotamia these institutions were the temples, which preceded the Uruk period. To an earlier complexity the Uruk period added the invention of writing (seals, sealings, and standard units of value were earlier inventions), a process that Adams (1981) calls "hyperurbanization," and a powerful ideology that sanctioned the

successful centralization of authority under the tutelage of the gods. The sacred precinct was set apart from the community, and perhaps, as Strayer (1970:18) states for the medieval European state, "a realization of this separateness was an essential ingredient of state building."

Finally, Algaze would have us believe that the peoples of southern Mesopotamia "were intellectually better prepared to deal with the complexities" than the inhabitants of the periphery. I have long wondered why people of the periphery did not assimilate the complexity evident in the south. Once exposed to writing, as they assuredly were throughout the century-long Uruk and later Proto-Elamite expansions, why did virtually every distinctive community on the periphery reject the use of writing? With so many different archaeological cultures exposed to the complexity of southern Mesopotamia, one could argue that the rejection of complexity was a conscious act. What was the reason for it?

Perhaps the gods of the north were, like the Polynesian gods referred to by Sahlins, simply less demanding. Perhaps, far from being intellectually less qualified to deal with complexity, the peripheral peoples were smart enough to avoid its oppressive command structure for at least another 500 years, when it was imposed upon them by military conquest initiated, naturally enough, from the south. In every instance the periphery initially rejected the adoption of complexity even after direct exposure to it. In time, the development of the state made possible such concentrated control of human resources that no other type of social organization could avoid being relegated to a subordinate role. Fundamental social change is rare, for it goes against the grain of social actors and their organizations. There is no inexorable logic that leads to social change or to social complexity. As Gellner (1988) has argued, most significant social change is brought about through fortuitous openings. Individuals and/or institutions that attempt to impose fundamental social changes are best characterized as adaptive failures. The people on the periphery chose to avoid complexity and, in so doing, avoided the cage of the state for another half-millennium. Perhaps southern Mesopotamia's ecological circumscription had something to do with both the loss of tribal ties and the harshness of its conception of the divine.

Complexity is a double-edged sword. Globalization is our modern complexity. Today in Pakistan, where I am excavating a site, the newspapers debate whether the country should accept International Monetary Fund loans. Such loans, according to one argument, allow rich Western nations to keep Third World nations permanently in debt. In not taking those loans they avoid the new complexity: globalization. Complexity is more than an evolutionary stage of the "initial"; it is a moving target that requires a more detailed understanding of the "social."

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Algaze addresses with new theoretical insight the long-standing question of why the Mesopotamian state emerged early in the southern lowlands. He has once again found much to strengthen current archaeological approaches with a new theoretical application from another discipline. His paper offers an original, nuanced, effective, geographically-environmentally situated explanation of Mesopotamian social development. In their ultimate assessment of Algaze's fine contribution, scholars will ponder several basic points: How good is the model, and how good are the data? I mention only a few aspects of each.

Algaze's article makes me want to read Jane Jacobs's economic work, for although I find his arguments compelling, it remains difficult for me to assess the underlying plausibility of human economies' developing in a fashion comparable to ecosystem development, with its explicitly biological evolutionary mechanism of adaptation through natural selection. Advocates of an explicitly evolutionary archaeology (e.g., Dunnell 1980, O'Brian 1996, Rindos 1986) might reasonably suggest that selection, an underlying mechanism in biological evolution, should be manifest also in human economies if they are to be described by models that link cultural and biological evolution. In Mesopotamia, archaeology has depended heavily on settlement data to infer patterns of social and political complexity, but these patterns do not in themselves indicate mechanisms of change. Selection—or, indeed, any other mechanism of cultural development—will be manifest at the household level of analysis, where individual decision-making and its consequences for reproduction can be best deciphered from data that are of high resolution both chronologically and spatially. If Algaze's thesis is testable, then household archaeology, albeit logistically difficult in southern Mesopotamia, provides the scale and locus at which it can best be tested. A household approach also serves to balance emphasis on archaeologically and historically highly visible elites in explanations of Mesopotamian state building.

Algaze does an admirable job of building a geographically patterned model that explains a nevertheless historically contingent developmental sequence. Tension between developmental predictability and system histories must be faced in all ecosystem models and, indeed, in evolutionary theory itself (Gould 1986, 1994). As Algaze notes, in the Mesopotamian case geographic predictability (propinquity and diversity) must be balanced with significant historical contingency, specifically, dramatic climate and environmental change during the 4th millennium B.C. Nevertheless, his model, perhaps influenced by Jacobs's interest in Spencer, leans toward a progressivist and linear approach to economic development with its emphasis on resiliency, expansion, and feedback loops to explain the inevitability of trade imbalances and

Uruk social hierarchies. I would like to read the arguments for loss of complexity too. Why would not random dramatic change, such as supposed loss of summer rainfall, from the environmental advantages enjoyed in the 4th millennium B.C. at least sometimes and in some areas have resulted in social homogenization and a heightened emphasis on subsistence production? Additionally, where adjacent areas with comparable resources show very different developmental trajectories, might not greater emphasis on historical contingencies explain intraregional variation?

There will always be hand-wringing over the data not available from southern Mesopotamia and disputes about those that are. For example, high percentage estimates of population concentrated in large settlements cannot but be affected by preservation factors that buried smaller sites during periods of aggradation and deflated them thereafter. I do not concur with Algaze's suggestion that millets and sesame were cultivated (implicitly with *décrue* techniques all adopted from Africa in a summer-cropping regime): evidence to support this simply is not available from Mesopotamia, Arabia, or South Asia at this date. All of us wish that more data were available from early households. Textiles as exports and metals as imports have long histories of scholarly debate and short archaeological finds catalogues. In the case of Uruk textiles, early weaving skills along might not account for the value-added workmanship attested almost 2,000 years later in Assyrian documents. I suggest that Uruk weavers, who found flax in short supply, depended rather heavily on wool as a novel basic textile fiber with an important new characteristic: wool, in contrast to linen, readily accepts a dye. Many dyes, such as those from safflower, marine gastropods, and indigo, come from widespread sources linked only by Mesopotamian trade (McCorriston 1999, Edens 1994, Zarins 1989). Although such dyes became archaeologically visible only in the 3d millennium, they offer the very raw resources that Algaze cites as critical energy captured for value-added exports. Dyed textiles surely imply that wool emerged as the major surplus textile fiber, a process with significant geographical and ecological parameters (McCorriston 1997). But these are mere details: Algaze has given us much to ponder and an important, coherent new solution to the old problem of environmental determinism and the Mesopotamian state.

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When I wrote my *Grundzüge einer Geschichte der Frühzeit des Vorderen Orients* (subsequently translated as *The Early History of the Ancient Near East, 9000–2000* B.C. [1988]), I specifically used the wording "a history," emphasizing that this was only one possible way of conceptualizing a history of the ancient Near East: I had in mind that either I or someone else would eventually write that "other" history. I am happy to see that such an attempt has been made on at least one of the most crucial questions which I tried to answer: why the Mesopotamian urban civilization emerged where and when it did. In particular, I welcome the attempt to focus on two "advantages" which I have always considered important but not important enough to my argument to merit a lengthy discussion. However, instead of opening a different line of argument, Algaze only reverses priorities.

Of his two advantages, fertility is for me one of the attractions for those new settlers who—wherever and whenever they had entered the alluvium—had caused the enormous population density which we observe in the southern Mesopotamian plain by the end of the 4th millennium B.C. The favorable situation for exchange or trade, in contrast, has long been recognized but as essential not for the emergence but for the shaping of this early civilization. Though of great importance at one or another point in the development, these advantages both fail to offer any explanation for the initial ignition. Wherever these settlers had obtained their experiences, they were acquainted with both agriculture and exchange. The new conditions offered by the alluvium certainly made life easier and in the long run could have led to new forms of organization, but it is difficult to imagine that these conditions could have created the pressure necessary to bring about changes of such magnitude as we see happening between the Ubaid and the Late Uruk.

Arranging our information differently, I maintain that rather than the confrontation with favorable conditions it was the challenge of coping with the problems of the vast alluvial plain and the totally unprecedented population and settlement density that resulted in urban complexity. Fertility is not only one of the incentives for occupying this plain in the first place but also responsible for the fact that on it less acreage was required to feed each person. This in turn enabled settlements to draw closer together, eliminating safety distances between the settlements and thus creating new problems, which demanded new solutions, and so forth.

Not denying that exchange/trade was an important factor, I am challenging the reasons for Algaze's assertion that it was one of the prime movers. On the one hand, I question two of the three points where he sees the main differences from the neighbouring areas: (1) Rather than offering a more varied concentration of exploitable subsistence resources, a vast plain with identical but close-ranged soil and climatic conditions has a more limited range of animal and plant species than the topographically and climatically diversified regions of the neighboring areas. (2) While on the local level a division of labor between fishermen, herders, and farmers would have led to some exchange, I cannot see any path leading to an exchange or even a trade system between the various regions of the alluvium and the cities—especially since the near-identical soil and climatic conditions throughout the alluvium almost certainly resulted in identical animal and plant populations. I simply cannot

see any reason for asymmetric relations' arising between the cities within the alluvium.

I could not agree more with what Algaze says about the difference in scale between the Mesopotamian alluvium and the neighboring regions—in particular because I have stressed this point myself over the years (Nissen 1988, 1995, 1999). However, I have the feeling that as much as Oates and Oates (1997), Lamberg-Karlovsky (1999), and Frangipane (1997) may have overstated their argument in order to find a balance to the alleged total supremacy of southern Mesopotamia in earlier days, Algaze also pushes too far. As I tried to show some time ago (Nissen 1995), we are confronted with shifting networks in which all parts respond to any changes anywhere within their areas. Undoubtedly, the Mesopotamian alluvium was driven to greater complexity at one point. But because of its limited and uneven resolution, our archaeological material tends to fool us when it seems to present us with evidence for continuing major disparities.

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This paper must be welcomed as an important, well-informed, and thoughtful contribution to the study of state formation in Mesopotamia. As someone who has long been interested in the economic and social potential of its irrigation economy, I am particularly pleased to see the environmental dimension reintroduced. I have no argument with Algaze's primary thesis, although it seems to me that the scale of the arable landscape constitutes a further limiting/enabling factor (compare Çatal Höyük) and that in this Brak and Hamouker are very significantly different from Warka. Indeed, it remains obvious that the complexity of the site of Warka in the second half of the 4th millennium B.C. is not paralleled elsewhere and that this precocity owes much to the potential of its landscape. My major criticism is that Algaze seems to have returned to an ecologically driven "centre-and-periphery" and that this view of the development of complex society in wider Mesopotamia is misleading. On current evidence the background to the complex recording and administrative systems of Late Uruk Warka and, indeed, to the stone and metal technology that created the outward symbols of its elite lies not in the south but in the north (Duistermaat 2000; Esin 1989, 1994; Oates 1996). One has only to look at sites like Göbekli, Nevali Çori, and Çayönü to observe a level of ritual and technological development so far entirely absent in the south. This in no way invalidates Algaze's general thesis, but it does bring into question his repeated assertions about "backward" and "less developed" polities in the north and their wider role.

Algaze writes that "multiple interacting urban settings of comparable scale had actually characterized the Mesopotamian alluvium for centuries *before* the Late Uruk period." This can equally be said of the northern plain, where the dating criteria are rather more secure than those used in the southern surveys. Indeed, Adams's "Early Uruk" type fossils are not "early" in the sense that the term is used in the north, where evidence for four very sharply differentiated 4th-millennium-B.C. phases can be identified. This is not to criticize Adams, whose pioneering work is fundamental to our understanding of state formation in the south, but only to point out a fact of life known equally well to him—that archaeologists can only work with the evidence that is available.

Algaze cites a small survey in the immediate vicinity of Brak as indicating a settlement pattern that "lacks the depth and range of settlement size variability found to surround contemporary southern Mesopotamian urban sites"; in this he compares survey data that are hardly comparable. Moreover, the sites indicated on Adams's (mislabelled) figure 13 (1981) are identified by criteria that are in northern terms "Middle Uruk" in date. At this period Brak is a site of some 100–160 ha, if one includes the area of the small sites which immediately surround it. Some 80 km to the east is 15-ha Hamoukar, with the estimated 30-ha Hawa only some 30–40 km farther east. "Middle Uruk" material is found also at the very large sites of Tell Barri, Shaikh Names, and Farfara (106 ha), with distances measured from Brak of 9, 15, and 28 km (Meijer 1986); unfortunately, at these sites the overburden of later occupation makes size estimates impossible. I should also add that the earliest phase of the tripartite Eye Temple was built in the indigenous "Middle Uruk" phase, well before the southern Uruk intrusion. An examination of the contemporary pattern represented by Adams's figure 13 reveals a generally similar but far less dense pattern of small sites, one with far fewer moderately large sites and the very few 40+ ha sites situated at a distance of 80 km or more upstream from Warka. I have no space to develop this point further, but it seems clear that in this "early urban" phase the evidence from the north is as compelling as that from the better-surveyed south; moreover, there is no evidence for a "complex, hierarchically organized" system in the immediate vicinity of Warka. Even more significant is the "Early Uruk" phase at Brak, with possible evidence of a city wall and certainly of a monumental walled compound on a site estimated at some 45 ha (Oates and Oates 1997, Emberling et al. 1999). At the same time (ca. 4000 B.C.) there is occupation at Hamoukar spread over approximately 300 ha (J. Ur, personal communication).

A second crucial question involves the role played by people of the 'Ubaid period in the north both in the development of the administrative techniques later to play an important role in the south but not as yet attested there and in the earliest organized acquisition of the resources of adjacent areas of Anatolia (e.g., Layer 7 at Değirmentepe, for which the evidence strongly suggests the presence of an 'Ubaid "outpost" [Esin 1985, 1989]). I agree that in none of these areas do we see a development of complexity that can be compared with Late

Uruk Warka, but it is here that Algaze's ecological arguments prevail. My point is that before the Late Uruk period the north played a more important role in the wider framework of social and economic development in Mesopotamia than is acknowledged in Algaze's otherwise excellent paper.

Minor points: (1) It is unlikely that grain was a major export (Potts 1986). (2) Doubts about both manuring and the degree of 3d-millennium salinization are expressed elsewhere (Powell 1985, Oates 1994); for example, the site of Ur flourished in the same geographical position for some 5,000 years, hardly an argument for rapid loss of soil fertility. (3) Brak should be added to the Late Uruk metalworking sites (Oates and Oates 1997: fig. 16).

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Since I am not a specialist in Old World archaeology, I will restrict my comments to what I believe are the important theoretical implications of this paper. Algaze, citing a recent review by Robert McC. Adams, notes that much of contemporary archaeological theory can be characterized as "social determinism." This body of theory locates the source of cultural change in social interactions between cognizant actors and plays down the determinative role of the physical environment. In contrast, earlier neoevolutionary theories viewed the environment as a key agent in cultural change and humans as more passive agents that adapt to changes in their environment. Algaze offers us a sophisticated approach that represents a compromise between these two epistemological positions. For him the natural environment is important as the critical *context* in which humans interact. Geography does not directly determine culture. Rather, it provides a suite of opportunities and constraints for people interacting within a broad physical and cultural landscape in space and time. From this perspective, some geographical areas are more conducive to the development of political and economic complexity, selecting, supporting, and/or promoting certain technologies and social organizations. As Algaze notes, these areas have "natural advantages" and are the loci of a "unique conjuncture" of resources.

In Algaze's analysis, a unique combination of geographical features in the alluvial lowlands of the Tigris and Euphrates Rivers provided the initial "impetus," the "initial developmental takeoff," or the "head start" for the emergence of complex society in the late 5th millennium B.C. Building on the seminal work of Adams and echoing the theoretical perspective of Elman Service, Algaze suggests that a mosaic of ecological niches would have promoted economic specialization by individual communities. This specialization, in turn, promoted export-driven trade economies inducing both cooperation and competition between these groups and ultimately driving an increase in political and economic complexity.

Once these regional economies were established, a new social dynamic was created that transcended many of the constraints of geography. This new dynamic constitutes the social determinist component of Algaze's model. It is implied in concepts such as multiplier effects, competitive emulation, self-aggrandizing elites, and the creation of socioeconomic asymmetries. One could argue that the adoption of information technologies, a critical factor in his model, is best understood within a social deterministic framework as well. In short, the nature of the physical environment (combined perhaps with correspondingly high population densities) explains the initial development of political and economic complexity in the region. It furthermore constitutes the context in which all subsequent cultural evolution was nurtured and constrained. But a set of *social* processes explains the emergence and maintenance of more complex political economies later on, a process that cannot be reduced merely to a type of environmental determinism.

In reality, most contemporary archaeological theories of the origin of complex society combine elements of both environmental and social determinism. In historical terms, this represents a shift in thinking from viewing cultural behavior strictly as the unconscious manifestation of underlying evolutionary principles to the incorporation of conscious human agency into processual models. The real challenge for anthropological archaeology, in my view, is incorporating human agency into testable models of cultural evolution.

In response to this challenge, many of our colleagues have too quickly abandoned comparative analysis and scientific logic. In spite of what some anthropologists have suggested, the recognition of human agency in evolutionary processes does not automatically require a "particularistic" or historically contingent view of cultural change. The empirical fact is that the more closely we look at regional sequences with more refined chronologies, the more we see striking parallels between cultural evolutionary patterns in different areas of the world. There simply are a limited number of effective ways to organize complex societies. Over time, people independently and consciously arrived at these solutions in a number of regions around the world. While I disagree with Algaze on some specific theoretical points, I agree with the general focus and epistemological assumptions of his argument, and I commend his effort to provide a testable model of the evolution of complex society in Mesopotamia using both social and environmental factors. It is a welcome contribution to anthropological theory.

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Algaze's paper takes up a theme that is periodically addressed in the literature on Mesopotamia (Gibson 1992, Hole 1994), and the author has made a welcome attempt

to factor the environment back into the development of civilization without taking a deterministic stance. Here I confine my comments to landscape productivity, regional asymmetries of population, and the significance and development of transport systems.

Algaze highlights three advantages that southern Mesopotamia had over neighboring regions. The first, greater resiliency resulting from more varied resources, means that there is inbuilt insurance against subsistence failure. Although this should result in greater system stability, in certain complex systems it *may* lead to destabilization (McGlade 1999:464). In the Mesopotamian case, rivers raised above flood basins by levees might break their banks, resulting in instabilities that called for adroit administration.

In the context of land use productivity, irrigation results in increased crop yield per unit area, but whether this also results in increased labor productivity has been much debated. Hunt (2000:274–75) argues for traditional rice cultivation that labor productivity can be higher with more complex technologies (such as irrigation), thereby allowing for increased agricultural surpluses. If this argument holds for irrigated cereals, the resultant surplus could have fed the increased labor required for Algaze's industries or for increased public works such as canal cleaning.

Transport has long been regarded as a fundamental advantage that southern Mesopotamia had over neighboring regions, and Algaze is correct to emphasize its importance. His assumption that the progradation of the Gulf would have necessitated the "construction of ever larger and more expensive canal systems" requires further scrutiny, however. In part this is because the piecemeal construction and extension of canals can cause major engineering problems that entail considerable reexcavation (Doolittle 1990:153). Algaze, quite reasonably and as have many before him, does not make a clear distinction between rivers and canals. Thus Adams (1981) regards large-scale canal construction as taking off in the 3d millennium B.C., and Nissen (1988) for the same time period states that mobilization of labor was fundamental to the construction of canal systems. Nevertheless, it remains unclear just how much of the channel system—up to 250 km in length—was actually excavated and how much labor was required for such public works. If the canals were dug, their construction could have exhausted the local labor supply that was normally engaged in cleaning and maintaining local canal networks. Such works would therefore have required the import of labor from surrounding regions, thereby fueling further population growth. An alternative mechanism for the development of the multiple channel systems characteristic of Sumer and Akkad is the enhancement of a natural process of bifurcation by local management. The low-gradient plains crossed by river channels raised by levees provided ideal conditions for the abrupt shift or avulsion of channels that results in such anabranching systems (Verhoeven 1998:174; Jones and Schumm 1999; Morozova and Smith 2000). These conditions, enhanced by substantial within-channel sedimentation and downstream decrease in discharge, can result in abrupt channel shifts that can be catastrophic to the inhabitants (Gibson 1973:454). However, localized cleaning and management of the node of avulsion or bifurcation could have maintained flow in *both* channels rather than one, thereby substantially increasing the water supply and transportation network. This would have provided the potential for increases in land use and population. It is not clear which of these mechanisms—large-scale canal digging or the semimanaged avulsion of anastomosing channels—produced the network that nourished the early cities, but either would have encouraged or allowed for increased population levels and would have contributed to the growth of polities in the south. Algaze's synergistic cauldron may therefore benefit from the consideration of these two human-environmental interactive systems.

Algaze correctly points out that water transport systems provided an advantage to southern Mesopotamia over peripheral areas such as northern Mesopotamia, but should we, as he asserts, assume developmental asymmetries between north and south? Available settlement survey data suggest that during the Ubaid period estimated population densities in parts of the peripheral regions exceeded those in the southern alluvial plains and maximum site size was probably similar to that in the south. By the early 3d millennium B.C. southern settlements were considerably larger, although estimated population densities were less than is often assumed (Wilkinson 2000*a*:244, 249). Thus during the 4th millennium B.C. the balance of urbanization may have shifted from the rain-fed north to the irrigated plains of the south. This shift may have resulted from processes discussed by Algaze or, alternatively, it may have fueled further growth of settlement in the southern plains. The question of regional asymmetries of settlement therefore needs to be addressed more explicitly by future studies.

By skillfully weaving together the physical environment and social and economic factors in one interactive system, Algaze has made an important contribution to the study of the development of the Sumerian civilization.

Reply

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I am grateful for the many insightful comments and clarifications raised by the various commentators, especially those of Friedman and Ekholm Friedman, who have chosen to examine in detail the speculative model that I proposed to explain the evolution of the import/export trade patterns characteristic of early Mesopotamian civilization. In brief, the model postulates three broad but overlapping phases in this evolution: a first phase characterized by largely internal trade between southern pol-

ities exploiting varied ecological niches unique to 4th-millennium Mesopotamia along principles of competitive advantage, a second phase in which import-substitution processes serve to homogenize the productive capabilities of alluvial polities, and a third phase characterized by heightened competition between polities that then possessed broadly comparable productive capabilities. In the course of this latter phase, individual southern polities appear to have made efforts to open external markets for now widely diffused industries easily adapted for export (principally the *new* dyed woolen textiles, as McCorriston insightfully notes) and to control the flow of external resources brought into the south. Both steps can be seen as ways to legitimize evolving social transformations and out-compete regional rivals.

Friedman and Ekholm Friedman agree in seeing the many ramifications of trade as central to processes of social evolution in early Mesopotamia but call for a more detailed characterization of the specific social processes whereby the advantages in trade of Mesopotamian society were translated into technologies of power. Specifically, they note the need for a thorough review of the systemic relationships between trade, forms of labor organization, slavery, information-processing technologies, and external expansion during the Uruk period. While their points are well taken, we should remember that the level of specificity required to prove causal relationships between evolving trade patterns and specific sequences of social change is simply not achievable in the Mesopotamian case for the period in which Uruk civilization first crystallized. There are three reasons for this: (1) the lack of detailed textual documentation, (2) the fragmentary and unrepresentative nature of the archaeological evidence at our disposal, and (3) our continuing inability to subdivide the Uruk period into anything more precise than 200–300-year phases.

Falling, as I do, into the formalist camp in debates about the nature of premodern economies (Polanyi 1957), I found it gratifying that Friedman and Ekholm Friedman see potential value to the use of the concept of import substitution to explain the socioeconomic processes in operation in protohistoric societies. They properly question, however, whether the available evidentiary base is strong enough to justify the use of concepts developed for the explanation of modern capitalist economies in the context of preindustrial societies. While this crucial question cannot be adequately addressed with the flawed data at our disposal, the use of modern economic models in an ancient Near Eastern context is justified on two counts. The first is that these models are not put forth as a prescription of conditions that must of necessity have occurred; rather, as Knapp notes, they are intended as hypotheses to be tested against the available archaeological data, which all too often are fragmentary and difficult to interpret. The second is that changes resulting from the emergence of modern capitalism may have greatly intensified and brought into sharp focus relationships of asymmetrical exchange leading to unequal development but by no means created those relationships, as Ekholm and Friedman (1979) themselves suggested more than 20 years ago. The evolutionary sequence for the initial development of import/export economies in southern Mesopotamia proposed in this paper is eminently testable, and I hope that improved artifact-recovery methodologies and changed historical circumstances in Iraq will soon allow a new generation of researchers to do exactly that.

Some of the commentators raise points of disagreement which I believe are more apparent than real and result from inadequacies in the exposition of my ideas. Nissen, for instance, argues that environmental advantages fail to explain the Uruk takeoff. Instead, he sees the challenge of large populations coping with an evolving alluvial environment as a trigger for social complexity. In fact, our positions are not as dissimilar as Nissen believes, although I do think that he underestimates both the degree of ecological variability of the southern alluvial plain in the 4th-millennium B.C. and the economic potential of marshes, lagoons, and estuaries. I see geographical and environmental advantages and social problems as causally and evolutionarily connected. In brief, my argument is that the inherent transportational advantages of the southern Mesopotamian landscape, its greater fertility and reliability, and the unique density and variability of its exploitable resources during the 4th millennium created the conditions wherein unprecedented population densities could emerge. Propinquity, in turn, is what created new social problems requiring resolution, and these problems were solved through the invention of revolutionary "ideational" technologies, principally new forms of managing labor that emphasized economies of scale and new forms of information processing and record keeping.

Other commentators raise important issues not properly addressed in my paper. Both Tony Wilkinson and Joan Oates, for instance, suggest that I erred in my characterization of the nature of Upper Mesopotamian societies during the prehistoric periods. Oates notes that by the Neolithic period (8th–7th millennium B.C.), an early northern advantage in integrative institutions such as cultic buildings/temples existed over the then sparsely inhabited south and that by the Late Neolithic and Halaf periods (6th–5th millennium B.C.) the north held an advantage over the south (Early Ubaid) in site size and in the complexity of administrative technology, as seen from the glyptic of the time. Wilkinson notes further that the available survey data suggest that during the Late Ubaid period (late 5th millennium B.C.), estimated population densities in parts of Upper Mesopotamia exceeded those in the southern alluvial plains and maximum site sizes were probably similar in the two areas.

In retrospect, it seems to me that Oates and Wilkinson are entirely correct when they argue that the north played a more important role in the wider framework of social and economic development in (Greater) Mesopotamia before the Uruk period than is acknowledged in my paper. Perhaps the time has finally come to abandon the concept of the "pristine" state or civilization and to acknowledge that processes of social evolution are always the results of regional and transregional patterns

of interaction (Kohl 1987*b*). The early social evolution of Greater Mesopotamian polities *before* the 4th millennium is thus best conceptualized as a process of parallel development in which constant interaction between different regions and cultural traditions fuels widespread processes of competitive emulation. This, in turn, serves roughly to equalize the rate and direction of the evolutionary trajectories of otherwise very different polities exploiting very different ecosystems. In this, the formative phases of Mesopotamian civilization appear similar to those of Mesoamerica, with its multiple but distinct traditions of social complexity (the Maya, Monte Albán, Teotihuacan) developing independently but in tandem as a result of comparable socio-evolutionary processes made widespread by extensive long-distance contacts (Marcus 1992).

The corrections to my characterization of social evolution in Greater Mesopotamia prior to the Uruk period introduced by Oates and Wilkinson serve to highlight even further the abruptness of the Sumerian "takeoff" of the 4th millennium, when the balance of urbanization, sociopolitical complexity, economic differentiation, and ability to project power at a distance shifted dramatically to the irrigated plains of the south. Nothing better epitomizes this shift than the Middle–Late-Uruk-period expansion of southern populations into selected portions of Upper Mesopotamia, although, as Dittmann notes, we still have much to learn about the scale and variability of that phenomenon.

Regrettably, some of the commentators fail to acknowledge the uniqueness of the Uruk revolution. Lamberg-Karlovsky, for instance, notes that several sites comparable to or larger than late-4th-millennium Uruk existed at the time in the context of the Tripol'ye culture in Ukraine. The even earlier Neolithic site of Mehrgarh, in Pakistan, estimated at 200 ha in extent (Jarrige and Meadow 1980), could also be added to his list. Oates, similarly, notes the existence of what she calls a 300-ha occupation of early Late Chalcolithic date (late 5th–early 4th millennium) at Tell Hamoukar, in northeastern Syria. These parallels are neither pertinent nor comparable. In trying to arrive at a cross-culturally valid definition of what is urban, Fox (1977) has noted that settlement size is one of the least important criteria and argued that the defining characteristics lie in the degree of internal diversity and complexity within a settlement. Thus defined, Uruk was certainly unparalleled by a second half of the 4th millennium. The Ukrainian sites never surpassed the village level of social complexity. Mehrgarh is also largely undifferentiated, and its excavator explains its anomalous size as the result of "horizontal stratigraphy" created as a much smaller settlement periodically shifted its location within a small area over time. Similarly, the excavator of Hamoukar, McGuire Gibson (personal communication, 2000), believes that a large portion of the 300-ha scatter of early Late Chalcolithic remains at that location is also largely the result of horizontal stratigraphy, possibly resulting from the use of the site as a center for the seasonal aggregation of nomadic tribal groups.

Oates also misses some of the uniqueness of the Uruk phenomenon when she argues that the scale and density of occupations in the north in the Late Chalcolithic period, spanning most of the 4th millennium B.C., were comparable to or even exceeded those of the south. She argues, for instance, that Tell Brak was somewhere between 100 and 160 ha in extent during the "Middle Uruk" phase. This figure presumes that the totality of the intervening area between the main mound and the ring of satellites surrounding it was occupied. Recent work in this area, however, found no evidence for such an occupation (Emberling et al. 1999:16–17, 25) and suggests that a substantial portion of the intervening area consisted of large clay pits excavated in support of building activities at the main site (Wilkinson 2000*b*:127).

Also problematic is Oates's claim that the density of Late Chalcolithic sites around Brak and the depth of the site hierarchy in its vicinity surpassed those characteristic for Uruk-period southern Mesopotamia, particularly those typical for the northernmost portions of the alluvium surveyed by Adams. This should be qualified in two ways. First, the Nippur-Adab region of the alluvium, where Oates notes the apparent absence of small and medium-sized Uruk-period settlements, is precisely one of the areas of southern Mesopotamia with the greatest amount of recent alluvial deposition, which naturally tends to obscure the smaller sites (Adams 1981, Reichel 1997, Wilkinson 1990*b*). Absence of evidence is not evidence of absence. I take it as a given that the various 40+-ha urban sites along parallel branches of the Tigris-Euphrates fluvial system in the Nippur-Adab region throughout the Uruk period did not exist in isolation from their hinterlands. Each must have been at the apex of a variegated settlement structure, even if the lower levels of that structure are now obscured by sediments deposited since the 4th millennium.

Second, while Oates is correct is noting that large sites with Late Chalcolithic-period materials do exist in the Upper Khabur area at reasonably short distances from Brak, the sites in question have not been surveyed in a way that allows us to ascertain their nature or their extent at the time. Clearly the time has come for an extensive and coherent survey of the Jaghjagh branch of the Upper Khabur, where Brak is located, that would go beyond the area covered by Eidem and Warburton (1996). Ideally, such a survey should follow the site recognition and recording guidelines established by Wilkinson during earlier work in the Sinjar Plains of northern Iraq (Wilkinson and Tucker 1995, Wilkinson 2000*a*) and now used in ongoing surveys elsewhere in the Upper Khabur area of Syria around Tell Beidar (Wilkinson 1998) and Tell Hamoukar (Gibson 2000). It may very well be that such future work will support Oates's contentions about the nature of the Late Chalcolithic settlement hierarchy around Brak, but at present we have no reliable evidence to consider beyond that discussed in my paper.

An important issue raised by some of the commentators is that of the role of religion in the transformations attending the Uruk revolution. A full examination of religion as a factor in the rise of early Mesopotamian

civilization was never my intention in this paper. Rather, my goal was to use Jacobs's ideas to gain insight into the precociousness and unique vitality of processes of urban growth and socioeconomic differentiation in Uruk-period Mesopotamia. I am quite aware that my discussions of the reasons underpinning the Uruk takeoff do not address the crucial issue of how the new ideological constructs of the states emerging in alluvial Mesopotamia at the time came into being. In any event, I fully concur with the comments of Charvát and Lamberg-Karlovsky as to the centrality of religion in the transformations that gave rise to Mesopotamian civilization. The central position that cultic structures occupy at the very core of Uruk cities, as seen at Warka, allows for no other interpretation. Further, Lamberg-Karlovsky is entirely correct when he argues that ideologies about the relationship between the rulers and the supernatural affect the relationship between the rulers and the ruled and that this represents a synergy as important as the socioeconomic and demographic ones highlighted in my discussion.

Returning to topics more directly addressed in my paper, I would like to expand on a comment by Brentjes that struck me as particularly important. This is the issue of the dual structure of the city of Uruk, with its parallel ceremonial areas, Eanna and Kullab. Here again is a case where understanding the importance of early trade in Mesopotamia may help us better understand the specific trajectory of early Mesopotamian urbanism and the form of early Sumerian civilization. Adams (personal communication, 2000) has suggested that early Mesopotamian twin cities such as Uruk and Kish may result from a conflation of two initially independent towns adjacent to but on opposite sides of a major canal or river branch. The growth of such (Ubaid) towns, initially founded along natural crossing points, into major (Uruk and later) cities can be understood in terms of the self-amplifying mechanisms discussed by Jacobs. Adams argues that twin-town-type settlements would have expanded in tandem with improved crossing facilities between them such as multiple boat ferries. In so doing they would have grown further as they attracted an even larger proportion of long-distance traffic from hinterlands on either side, with their embankments becoming docks for transfer of shipments from boats to caravans and vice versa.

I would like to close by turning to issues raised by Cioffi-Revilla and Stanish regarding the role of agency in human history. Cioffi-Revilla argues that the environmental, geographic, demographic, and socioeconomic variables that are the focus of my paper and of comparable efforts by like-minded colleagues studying the origins of early states and civilizations elsewhere fail to address the proximate causes of the phenomena we seek to comprehend, which he sees as entirely political and historically contingent. He is certainly correct. However, because of the nature of the evidence at our disposal for early "pristine" civilizations across the world, we regrettably will never be able to reconstruct in detail the various strategies used by elites in the earliest states that appeared across the world to convince commoners in their societies that their interests were coterminous—what Cioffi-Revilla refers to as the "collective-action problem." One way to approach this conundrum would be a systematic analysis of the available ethnohistoric record of the modern era to explore how the collective-action problem was solved in documented cases where chiefdom-level societies were transformed into states. This analysis could then serve as a source of testable hypotheses applicable to analyses of social dynamics at the time the world's earliest states and civilizations emerged.

Agreeing with Cioffi-Revilla on the need for explanations that take into account the decisions of conscious actors, Stanish argues that the principal challenge in anthropological archaeology today is finding a way to incorporate the vagaries of human agency and historical contingency into testable and cross-culturally applicable models of social evolution. While I am less optimistic than he about our ability to identify agency in the archaeological record, I believe that an approximation in the aggregate can indeed be achieved. In my paper I tried to meet Stanish's challenge by suggesting that some types of human actions, such as the will to accumulate status, wealth, and power, are predictable across both cultures and time (Hayden 1995:20–23) and that some geographical areas are more conducive to achieving these goals than others. This naturally results in differential levels of probability for the development of initial social complexity across the landscape. Southern Mesopotamia in the late 5th and 4th millennia B.C. proved to be particularly fertile ground for precisely such a development.

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